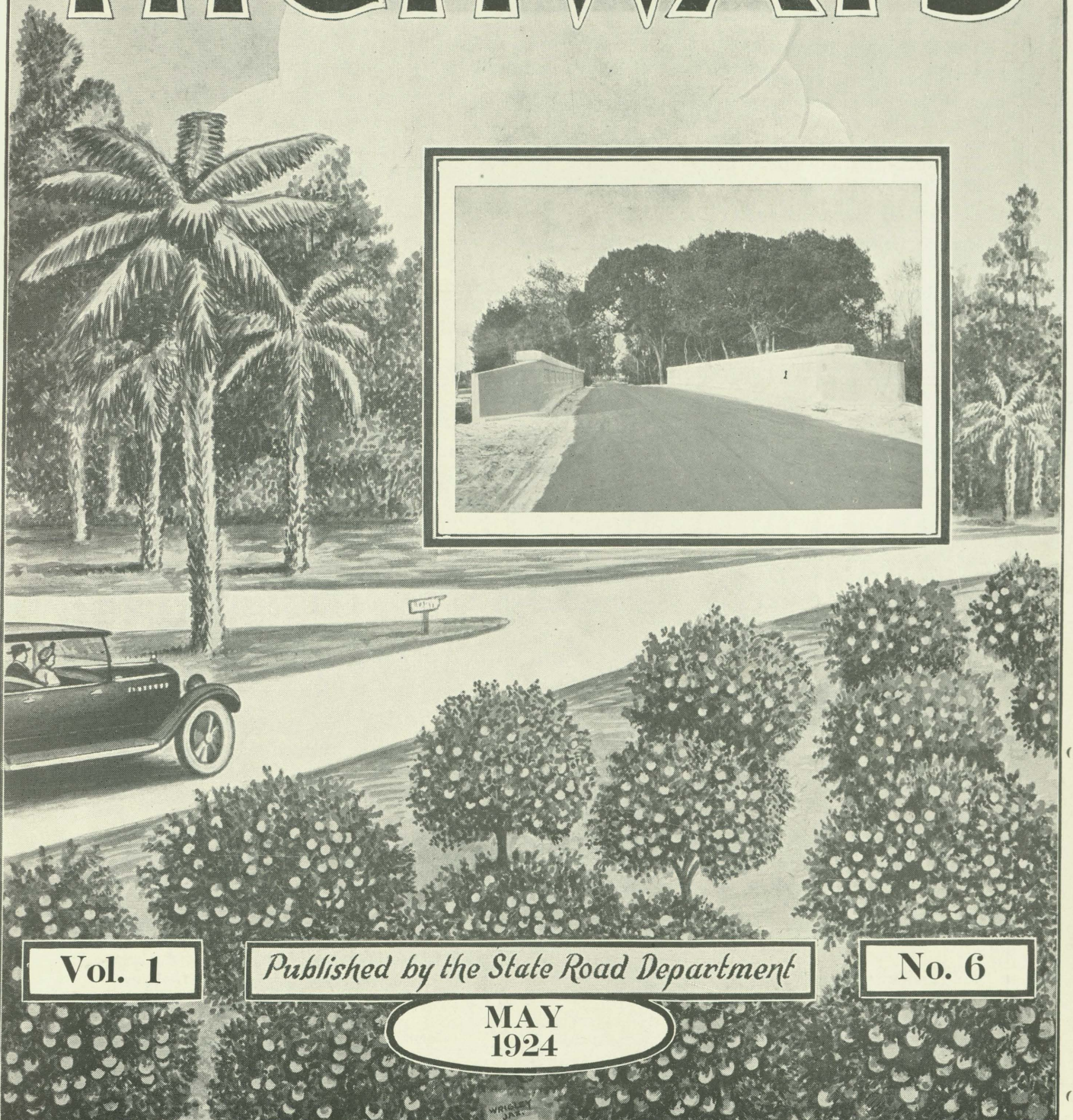


FLORIDA HIGHWAYS



Vol. 1

Published by the State Road Department

No. 6

MAY
1924

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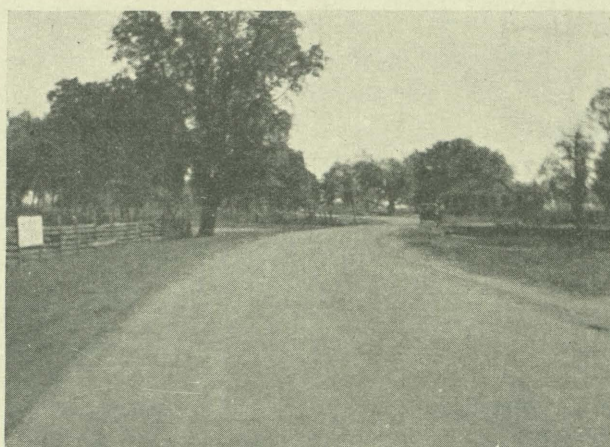
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FLORIDA HIGHWAYS



Vol. 1

MAY, 1924

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FLORIDA HIGHWAYS

By J. L. CRESAP, State Highway Engineer

(From an address delivered before the Road Conference held at the University of Florida, February 14th, 1924)

There is so much that could be said regarding the highways of Florida, I am somewhat at a loss as to just where to start or just what to say.

I have had the good fortune to have been connected with the road building business of Florida for nearly seven years and during this time the evolution of the road or highway has been something wonderful.

It was supposed a few years ago that the highest ideal of a road was one graded about twenty feet wide, with little or no ditches, and with a surface nine feet in width.

When the State Road Department began the construction of roads, our specifications usually called for a forty-foot right-of-way and a twenty-foot grade. When the Department saw what the public would demand and changed the width of the right-of-way to sixty-six feet and the width of the grade to thirty feet, there was a great deal of criticism, not only throughout the State, but even some of the members thought it was only a dream and would not survive.

Today most of the counties in the State have either adopted this as a standard or have gone one better and secured even a wider right-of-way.

The State Road Department takes a traffic census in about twenty-five places on the main roads of the State, one day or twenty-four hours each month.

It is really astonishing to see the increase in travel just as soon as the road is improved.

I used to think that the importance of a road and the travel over it, was wholly dependent upon the country surrounding it, but from more than casual observation, I have decided that the importance of any road or the amount of travel on it, is almost in proportion to the number of miles of good hard surface on it.

One road in this State which is not on the main system carried a travel of about fifty vehicles per day, until it was improved and now it carries any-

(Continued on Page Four)



Florida Highways

Published Monthly
Official Publication of the State Road Department

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This magazine is edited in the offices of the State Road Department, Tallahassee, and published monthly. Subscription rate, one dollar per year. Permission is granted to republish, with proper credit, the matter contained herein.

Application has been made for transmission through the mails as second-class matter.

B. A. Meginniss, Attorney for the Department,
Editor and Business Manager



HELPFUL LEGISLATION

Hon. J. H. Smithwick, Congressman from the Third District of Florida, has introduced in the House of Representatives a bill which has for its object the admission to the mails as second-class matter of periodical publications issued by State road departments or commissions. The bill, which is known as H. R. 7790, has been referred to the Committee on the Post Office and Post Roads and has been printed. Its full text, omitting the title, is as follows:

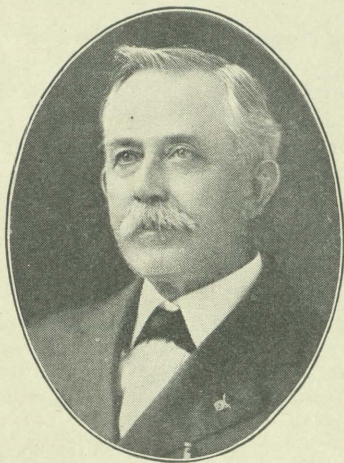
"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter periodical publications issued by or under the auspices of State road departments or commissions shall be admitted to the mails as second-class matter, and the postage thereon shall be the same as on other second-class matter, in the same manner and upon the same conditions as periodical publications of strictly professional, literary, historical, or scientific societies."

When Florida Highways was launched as a publication of the State Road Department, application was made to the postal authorities for its admission to the mails as second-class matter. It immediately developed that the present postal laws were not sufficiently broad to include it under the periodicals entitled to such admission, although it was recognized that as a matter of strict justice there was no reason why it should not enjoy the same privilege as the periodicals mentioned in the last clause of the proposed bill above quoted. The application, as a matter of course, had to be denied.

Appeal was made to Mr. Smithwick, who is a member of the Committee on the Post Office and Post Roads, for assistance, and he has introduced the bill to remedy the situation. The editor of this magazine has requested the assistance of other State highway departments and commissions, many of whom have already secured promises of assistance from their Congressmen.

It is believed that there will be no difficulty in securing the passage of the bill, especially if the State officials interested in highway publications will present to their Congressmen the justice and the necessity for the legislation, and we take this means of requesting those officials to seek the assistance of their representatives in Congress. There seems to be no valid reason why the law should make a distinction between periodicals issued by agricultural departments and health departments of the several States on the one hand and the road authorities on the other. The value of good roads to any State is too well recognized to admit of any argument and publications such as ours, which have as their object the promotion of the cause of road construction and maintenance would seem to deserve this assistance.

Chairman's Column



THE TOURIST AND INTERSTATE ROADS

One of the established businesses or interests of Florida is the tourist travel and the trade and business it brings to the communities through which this travel passes and in which it abides for a time. The time was when we were wont to sneer at the tourist. We did not think much of those fellows who came here from the States north of us and spent several months in the winter poking about the State, hunting, fishing, motoring, et cetera. It all seemed so silly and trifling to us natives who were trying to make our living growing corn and potatoes. We did not think much of those cities and communities which sought and worked to get the tourist travel and trade. We thought that trying to make a living out of the tourist was mighty poor business. But we discovered that these folks spent money, real money,

cash, and that is what we were badly needing. And they who came here to hunt and fish and to have a good time generally for a while in the winter began to buy property and settle and develop those portions of the State in which they were interested. So, we learned the value of this travel from the outside, and now, every live community in the State is seeking the one-time despised tourist travel and the Road Department is being urged to build roads leading to the State line at all points in order that the travelers may come in and see the country.

The travel to Florida is largely by rail and steamship lines, but in spite of the many miles of indifferent roads north of us, many thousands of people now come to us by motor cars, and we know that many more would come if we just had one or two good highways leading to Florida. Would it not be well for our friends in peninsular Florida (to which section most of the travel goes) to give this matter of through roads to Florida more thought than it has been receiving? Heretofore we have relied largely on outside road associations to do the planning for these through routes and many impracticable propositions have been put forth, with the result that we have much confusion and waste of effort. It must be borne in mind that we have to rely on the State Road Departments of the several States to build connected highways. It seems to us that it would be well for our people, through some agency, to get in touch with these State departments, get definite information as to what has been done and what may be expected in the near future as to the several routes leading to this State, and then for the present lend their influence and what help they may towards the building of the most practicable route that gives assured promise of early completion.

KIND WORDS

Highway Publications

Twenty-five States now get out monthly or weekly publications in the interest of highways. Arkansas, California, Florida and Utah have recently added interesting publications to the monthly list. All States are beginning to realize the urgent need for a publication of this kind in order that the people may be kept informed with accurate and reliable information regarding the activities of the State Highway Department. Such publications are both interesting and instructive. We congratulate these last four States on this forward step.—Texas Highway Bulletin.

Florida Highways

Florida Highways is a magazine published by the State Road Department and is a credit to the State. Many beautiful scenes are pictured in each issue. This publication is an asset to the State at large.

Mr. B. A. Meginniss is editor of the Florida Highways and he is to be congratulated upon the merits of the magazine.—Tom Wentworth's Magazine.

FLORIDA'S NEWEST CONCRETE ROAD

On pages five, twelve and fifteen of this issue we are showing the first pictures of Project 27-A, twelve miles of concrete road in Columbia County, south of Lake City. This road which is two feet wider than the well known Lake City-Jacksonville highway, is one of the finest pieces of road construction in the South. At the time of going to press it is being finished and is very nearly ready for acceptance by the State.

COVER PICTURE

The insert on this month's cover is a photograph of a bridge on State Road Number Four in Broward County. The splendid work which has been done by this county on this road may also be judged by the photograph appearing on page seven of this issue. On page nine there is also shown the substantial and graceful bridge over New River at Fort Lauderdale in the same county.

FLORIDA HIGHWAYS

(Continued from Page One)

where from three hundred to five hundred cars per day.

This road I refer to is a sand-clay and gravel road which most of you would consider inferior compared with some of the excellent roads of central and south Florida.

I could take up your time in giving you a very detailed description of just what constitutes a good road. I could tell you many things about co-efficients, ductility, penetration, elastic limits, etc., of the various materials entering into the construction of such roads, but this I will not do, as every engineer in this audience already knows just what I would say, or knows where to find it out, and those who do not know would be none the wiser for my having told them.

Let me generalize a little more and take into consideration some of the main features entering into the construction of an honest-to-goodness road built on the same business plan as you would undertake any other kind of work of similar importance or equal cost.

If you were going to construct a million dollar hotel, a large manufacturing plant or any other business establishment requiring the outlay of any considerable amount of money, you would exhaust every resource in trying to find the most suitable place for the same. You would not select the first place you came to as you would want to investigate the advantages or ascertain the disadvantages of this place compared with many others.

In locating a road you should not be satisfied with just a location as anybody can run a line on which a road can be built. You should make your investigation so thoroughly that you would have a reason based on good judgment and scientific deductions why each stake is so placed along the center line of your location.

Drainage, it is useless to say, constitutes the most important single item in the construction of Florida roads and it is a foregone conclusion that it is one item that will sing the praises of the engineers throughout the coming ages, if successful, and will on the other hand condemn him to eternal darkness and disgrace if not.

I believe that today the engineers and road builders of Florida are giving more consideration to the drainage of their roads than ever before, and the day is fast approaching when failures from this cause will be an exception rather than the rule.

The grading of a road is not only the cutting down of the high places and filling in the low ones along the right-of-way, but it is one step in the construction of a finished monument and should receive the same care and attention as the placing of the seal coat on an asphalt surface or the hand-rail on one of the many artistic bridges which adorn the highways of the State. Before grading is done, stakes should always be set showing the depth of cuts, the height of fills, the location and grade of side ditches, as well as any other information necessary to insure the work being done neatly and in an orderly manner.

This old idea of securing material for the roadbed

from the most convenient place without respect to looks or drainage, should be done away with, and when the grade is finished it should be true to lines and grades.

If you will make it a thing of beauty it will be a joy forever.

In Florida, more than in any other State in the Union, the highways should appear pleasing to the eye, as most of those using them in certain seasons of the year have nothing else to do but criticise and compare them with what was done at home, whether it was done or not.

Florida has been spending, and is spending, thousands of dollars yearly in advertising the beauty and grandeur of the State, but I believe the money spent in the beautification of the highways will pay a larger dividend than any other advertising that can be done. I do not mean by this the mere planting of flowers, shrubs and trees, but I do mean the proper construction and maintenance of shoulders, slopes and ditches of the road as well.

No engineer or road builder would in any way try to minimize the relation which the surface of a road bears to the road as a whole. You may have the most perfect alignment, the most adequate drainage, and a grade constructed in the most careful manner, but if the surface is not what it should be you will never have a road and the public will not fail to tell you so.

The surface of the larger per cent of roads built in this State consists of two distinct parts, the base and the wearing surface.

I believe Florida is blessed with material with which to build a base, which is now playing and will continue to play an important part in the road program of the State. Not until recent years have the road builders of Florida realized this valuable asset.

I believe the so-called stage construction as adopted by the State Road Department and approved by the Bureau of Public Roads, will be the means of getting more miles of good roads built than by any other method known today.

It has been demonstrated beyond any doubt that a base built properly of Florida lime rock and maintained with surface treatments, will produce a road which is economical to construct and reasonable to maintain.

In saying this, I would not in any way discourage the construction of a finished pavement, but as the miles of roads needed just at this time are far greater than the amount of money available, I believe the adoption of the method of stage construction is the only solution.

The Department as well as myself have numerous inquiries from county and city officials as well as individuals, as to what is the best pavement to construct in Florida.

To my mind this is a question which so far has not been answered. In replying to such inquiries I usually state that the Department has and is constructing roads of many types and so far results have not been such that we can call any one best. But that any of the higher types of pavements built properly will give "value received."

It is not so much the so-called type of road you build but the manner in which this type is built and the materials entering into its construction.

I have seen roads in Florida, when completed, that were a pleasure to ride over as the wearing surface was perfect, again I have seen these same roads when it was a pleasure to detour them, as the surface had no support and it could not play the game alone.

As a general rule the maintenance cost of a road is practically inversely in proportion to the original cost; that is, the lower the type the higher the maintenance cost.

There have been many miles of sand-clay roads built in Florida and as a general rule have been good investments. When a sand-clay road is constructed as a part of any important through highway, it should be only the first step in the construction of a finished product. It should be maintained as a sand-clay road so long as it can be done economically and when this time has elapsed provisions should be made to construct a higher type pavement.

I call to mind one county of this State which has adopted this method and I do not believe there is a county in the State that has gotten more for the money expended.

Up to December 31st, 1923, the State Road Department had completed sixty-six miles of concrete surface, twenty-four miles of brick, fifty-two miles of sheet asphalt, 135 miles of bituminous macadam, fifty-nine miles of rock base with surface treatment, 252 miles of sand-clay and 175 miles of graded roads, a total of 769 miles.

During this same period the Department constructed the following reinforced concrete bridges:

One 43 feet long, two 47 feet, two 52 feet, one 64 feet, two 68 feet, one 76 feet, two 106 feet, one 135 feet, one 210 feet, one 215 feet, one 325 feet, one 340 feet, one 370 feet, one 476 feet, one 1,178 feet, one 2,008 feet and one 2,627 feet, a total of twenty-one bridges with total length 8,340 feet.

Of these bridges two have bascule lift spans and two have steel spans across the main channels.

Also the Department constructed 5,428 lineal feet of creosoted timber bridges, being in most cases approaches to permanent bridges and will at a later date be reconstructed of a permanent type.

SOME SPEED

"Waiter," said a customer after waiting 15 minutes for his soup, "have you ever been to the zoo?"

"No, sir."

"Well, you ought to go. You would enjoy seeing the turtles whizz past."—Juggler.

IN MEMORIAM

Here lies the body of "Stubborn Gray";
Who died maintaining his right of way.
He was right, dead right, as he sped along,
But he's just as dead as if he'd been wrong.

SPEAKING OF BAY WINDOWS

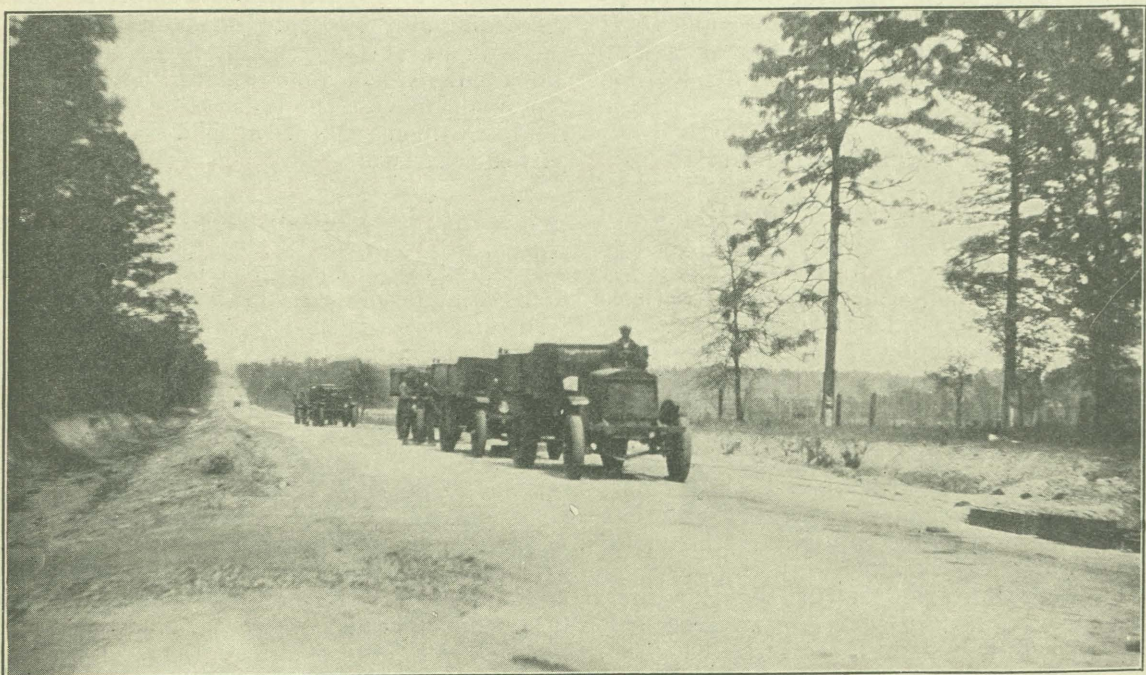
Rotund husband—"You haven't seen my belt around the house, have you?"

Sarcastic wife—"Oh! did you put it around the house?"—Lampoon.

A SHORT TRAGEDY

Reckless Huge
Car New
Whistle Blew
Cried "Pooh!"
Train Flew
Funeral at Two.

—National Motorist.



Road No. 2, Project No. 27-A, Columbia County. A Section of Florida's Newest Concrete Highway.

Practical Hints to the Field Engineer on Concrete

Paper Presented Before the American Association of Engineers at Montgomery, Alabama.

CHAS. D. SNEAD, U. S. Senior Highway Bridge Engineer.

Some weeks ago, I found my way into the kitchen. Entering the room through a cloud of flour, I found the table filled to overflowing with numerous boxes, sacks, measuring devices, bottles, and last, but not least in importance an open cookbook. In answer to my question I was advised that a new receipt for lightbread was being tried. Everything had been properly weighed and measured in accordance with the receipt and the dough thoroughly mixed. Two bakings were necessary. Through curiosity I remained. The first pan of dough went into the stove and came out flat, sad, and heavy. The second pan yielded a loaf light in weight and crispy brown. The first loaf was a failure. The second loaf was a success. Both loaves were baked by the same person, in the same stove and from the self same dough. In the first case the temperature had been overlooked and failure had resulted from too cold an oven.

Strange as it may seem, there is a striking parallel between the bread making and the making of concrete. The Specifications for the making of concrete appear so simple and the rules so easy to follow, that it is difficult to understand just why anyone cannot make a first class artificial stone when it is only necessary to add water to a mixture of cement and hard, inert graded particles to obtain the finished product. How often do we find the simplest things in life the hardest to perform. And so, with the making of concrete, we find a definite following of the rules so simple that the rules are often considered unnecessary refinements and are passed over as such, or else are overlooked in an attempt to find something difficult to accomplish. It is the overlooking or the passing over of the requirements which leads us to bake our bread in too cold an oven.

Relationship of Engineer to the Work

Not infrequently the engineer is prone to waive some of the requirements in an endeavor to rush or cheapen the work. Too late it is realized that the results expected have not been attained. Sometimes a contractor overlooks these details and submits his bid without a full realization of what is expected of him or his work. Rejection of his work or a large monetary loss is the usual sequel to his oversight.

The position of the engineer in charge of work is, at all times, a hard one. Clear thinking, experience, good judgment, firmness and diplomacy on the part of the engineer are demanded. Experience and co-operation on the part of the contractor are equally essential. Two points should always be borne in mind by both the contractor and the engineer; first, unsatisfactory work can always be prevented and, therefore, is not to be condoned or excused; the second point is the fact that the engineer is assigned to a job to insure satisfactory work. Work cannot be repaired, even at a much greater cost, and made

as acceptable, as it would have been had it been rightly built in the first instance. Satisfactory work is at all times the cheapest.

Were an engineer assigned solely to see that the proper materials were furnished and the requisite amounts employed in the work, he could be effectively replaced by testing laboratory reports, sealed shipments of materials and the water boy on the job who could count the number of sacks, wheelers of aggregate, pieces of reinforcement, etc., with the same accuracy as the engineer. An engineer is placed upon the work to assist the contractor in doing his work in an acceptable manner. The engineer should plan ahead, anticipate and provide for the contractor's wants. Under no conditions, should the engineer be expected or be called upon to assume the role of contractor's superintendent or foreman. This is clearly not one of his duties. The best assistance that an engineer can offer is in the planning ahead of the work, helpful explanation of the plans and an insistence upon the execution of the work in accordance with a reasonable interpretation of the specifications. Experimental laboratories and stations are equipped to try out and test new methods, devices, and combinations of materials. An active project is a poor place to try out new ideas that are at variance with the specifications. The average contractor is a poor loser and rightly so, when he learns that his departure from the specifications has resulted in the condemnation of his work. My observation has been that a contractor never complains long concerning hard inspections if he finds each succeeding unit is accepted without adverse criticism and without the expense of placing a force upon each unit for the second time to finish the work in an acceptable manner. The failure to enforce good work results, without exception, in dissatisfaction to all parties concerned.

Concrete Materials

In thinking of concrete, one naturally considers first the materials entering into its makeup. Portland cement, a cement obtained by grinding clinkers resulting from the burning to semifusion, of an artificial mixture of approximately three parts lime carbonate and one part silica, alumina and iron oxide, is almost exclusively employed as the cementing material. This material is manufactured in various sections of the country and is placed upon the market under well known trade names or brands. Minimum requirements have been arrived at for the grading of all brands of cement as satisfactory or unsatisfactory. The tests are made in the laboratory. Some brands of cement indicate a greater strength ratio than do others. This fact would warrant the prediction that some day the minimum requirements will be raised and a better quality of cement secured. Because a cement passes the labora-

tory test at one time is not sufficient reason for it being finally accepted for the work. Cement improperly stored and unprotected from the weather and dampness becomes lumpy and hard within the sacks and is unsatisfactory for use. Check tests are advisable to determine the fitness for use of cement which has been stored for a long period of time. Laboratory tests require time. Samples of cement for tests should be rushed into the laboratory immediately upon the arrival of each shipment to avoid delay of the work. Mill tests by reputable testing laboratories and sealed carload shipments of cement, will avoid the possibility of delays awaiting the results of tests.

Laboratory tests of the fine aggregate should always be made. Tests for the grading, the strength, and for the detection of organic matter not apparent from visual inspection should be made. The specifications require that the fine aggregate shall be well graded from the coarse to fine and that all particles shall pass the $\frac{1}{4}$ inch mesh. The percentages of the aggregate which shall pass the other standards mesh sieves, are clearly stated. Of the two strength tests made the twenty-eight day test is of the more importance since it shows the strength of the sand grains. In determining the strength of fine aggregates, a comparison with Ottawa sand is made. Ottawa sand is a natural sand composed of particles of almost uniform size. All particles are required to pass as 20-mesh sieve and to be retained upon a 30-mesh sieve. The test with Ottawa sand presents the minimum requirements. A sand which just equals the strength of Ottawa sand is in the same category as the school boy who makes 60 on his examination and just passes the grade. He would not be considered a brilliant pupil and neither should we consider sand barely meeting the minimum requirements for strength as preeminently satisfactory and fit for use without a constant checking up to see that it has not fallen below such requirements.

Suppose the sand is too finely graded, what is the effect? Mortars made from fine sands are less dense and have less strength than do mortars made from the coarser sands. Consider the sand as particles which are to be thinly coated with a glue, the glue representing the cement and water. We know from every day experience that a glued joint is weak if too little glue is used and portions which are to come into contact are not fully coated. In the present case of finely graded sand in which the cement is assumed to coat over each and every particle, we should have too great an area to be covered with the cement which was designed to just cover a properly graded sand on account of the great number of fine particles and we should have also more unfilled voids between the grains themselves. In a properly graded sand, the fine particles of sand and the cement are sufficient to fill the voids more effectively. Such an explanation must indicate why there is a lack of density and less strength. By the proper grading of the fine aggregates, the maximum strength, density and imperviousness of the mortar is obtained.

If the sand be too coarsely graded, it is but natural that the small voids between the individual sand grains remain unfilled. A mortar lacking in density and a mortar less impervious will no doubt be the result. Such a mortar is often spoken of as "harsh."



Section of Road No. 4, Brevard County. Built by the County.

In order that a uniform grading of the sand used in the work may be maintained, each job should be equipped with scales for the weighing and sieves for testing the grading of samples obtained from each carload upon its arrival at the site.

In speaking of the fine aggregate, the term "sand" has been employed. Sometimes stone screenings are substituted for the sand. When stone screenings are substituted, it is necessary to remove the stone dust from them before using in the concrete. A higher strength ratio has been found necessary for screening than for sand in order to insure a concrete of strength equal to concrete resulting from a fine aggregate of well graded sand. It has been determined that approximately 50 to 80 per cent of the stone screenings will be retained upon a 20 mesh sieve.

Sand for use in concrete must be clean, uncoated, hard durable particles, free from shale, lumps of clay or other matter which will disintegrate or deteriorate under weather. Freedom from organic matter which may not be detected by visual inspection is also essential.

What has been said relative to the necessity of a properly graded fine aggregate is equally true of the coarse aggregate. If the coarse aggregate is of uniform size, a deficiency in mortar will result. If the individual particles are larger than the maxi-

imum size specified and the aggregate be used for reinforced concrete, voids around and below the steel may result from the inability of the larger sizes to pass between the reinforcing bars. If the coarse aggregate be too finely graded a deficiency of mortar may also occur. If a fine coarse aggregate and a coarse sand be employed, an excess of voids will be the natural outcome. This last mentioned condition is prevalent in this section of the country. Like mortar, which is dependent upon the grading of the fine aggregate, concrete is dependent upon the grading of the coarse aggregate for maximum density, imperviousness and strength.

What material shall constitute the coarse aggregate of a concrete is determined both by the availability of materials and the character of the work into which the concrete is to go. In general, crushed stone and gravel are used. Slag obtained from blast furnaces is also sometimes employed.

Speaking solely from personal observation, stone or gravel make a concrete easy to handle, easy to work in the forms around the reinforcing bars and easy to finish after the removal of forms. Concrete resulting from the use of slag as a coarse aggregate, has, in many instances, proven deficient in mortar, hard to flow in the forms and around the steel, to obtain a dense concrete and hard to finish when green, due to the pieces of light slag which have floated to the outside and top surfaces. This statement does not imply that a satisfactory concrete cannot be secured with a slag coarse aggregate. My observation is that, in the past, good jobs have been the exceptions.

Stock piles of all aggregates should be thoroughly drenched with water before using. In the case of slag, it is believed wise to thoroughly wet the stock pile several days prior to using and to keep the pile drenched. This wetting of the slag has been found to make it work easier and to reduce the absorption of the mixing water by the slag especially during the handling from the mixer to the forms. Slag is more porous than stone or gravel. An excess of mortar is necessary to fill the voids in the slag and to furnish an amount sufficient to properly work the slag after depositing it in the forms. Roughly speaking, it is well to provide about ten per cent additional mortar for the above conditions. Slag must be carefully inspected at the site to see that all of the iron has been removed from the magnets. Handpicking has been necessary in a few instances. There would appear to be little monetary saving to a contractor from the use of a slag as a coarse aggregate in reinforced concrete structures due to the increased cost of securing work of equal quality and finish to that secured by the use of stone or gravel as a coarse aggregate and to the added cost of the excess mortar herein recommended. In plain concrete, it is more probable that satisfactory results may be obtained with slag as an aggregate.

Rejection of aggregates because of poor grading should be as a matter of last resort to obtain satisfactory materials. Shipments of aggregates are often received which are very poorly graded. It is probable that such aggregates can be screened, screened and recombined or merely combined with the wanting sizes and thus be made satisfactorily to pass all tests without serious loss to the contractor.

Mixing Water

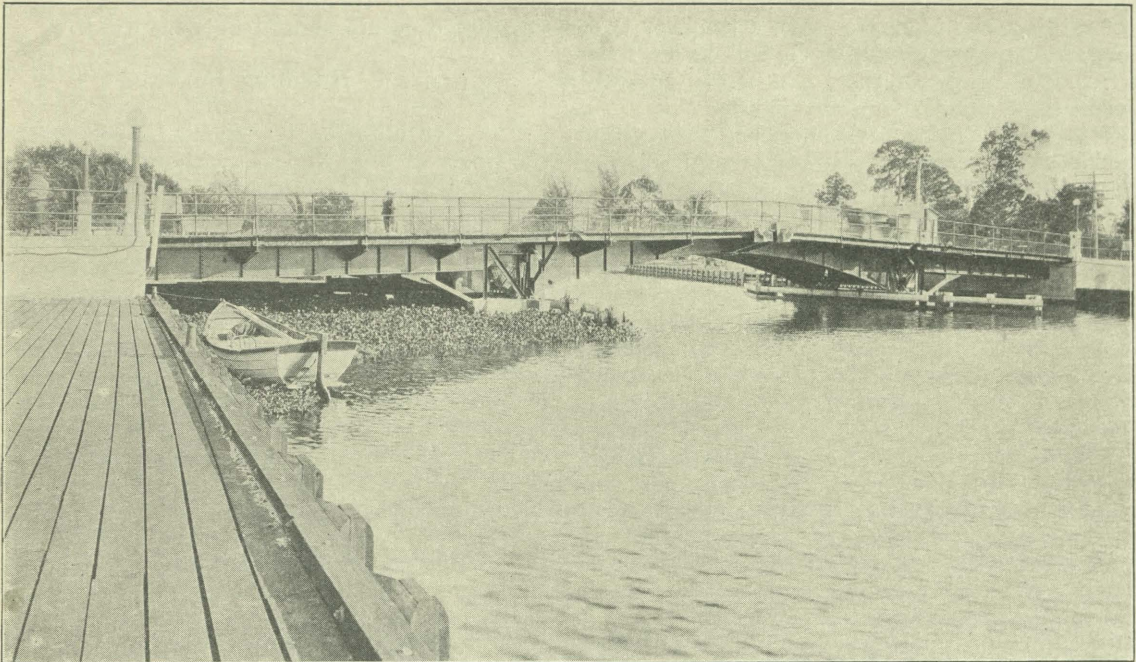
No attempt will be made to outline the quantity of water which might probably be required. A minimum amount of water must at all times be used to secure the maximum strength of concrete. Abrams says: "One pint more water than necessary to produce a plastic concrete reduces the strength to the same extent as if we should omit 2 to 3 pounds of cement from a one bag batch." He suggests the following rule: "Use the smallest quantity of mixing water that will produce a plastic or workable concrete." Just how much water should be used depends upon the aggregate employed, the free water in the stock piles, the length of time in mixing, the mixer itself, for what purpose the concrete is to be used, that is; whether for mass or reinforced work, and finally upon the experience and judgment of the engineer. The correct amount of water should be determined by measurement of the flow of the concrete. Measurements should be made at the time of beginning the work in the morning and in the presence of the concrete foreman. Hourly check measurements should be made also in the presence of the foreman and the necessary correction in the water made. By taking the measurements in the presence of the foreman, all disputes can be eliminated as to the water content. Opinions as to water will otherwise vary. The end desired to be obtained is a dry but workable concrete. It is well nigh impossible to flow a dry mixed concrete around the steel reinforcement. Too dry a concrete in reinforced concrete will result in excessive honey-combed areas and must be avoided equally as much as too wet a concrete.

As previously stated, a greater amount of water is required for concrete which is to be employed in reinforced work. Concrete which is to be placed by means of a tremie or bottom dump bucket needs to be even more wet than concrete in reinforced work. The natural tendency is to presume that there is enough water in the cofferdam and that a dry mix should, therefore, be employed for this type of work. To deposit concrete satisfactorily under water, the end of the tremie or the bottom of the bucket must be lowered within or buried into the concrete previously placed. Why is this necessary? To prevent the water in the cofferdam from washing out the cement. Only the top concrete is subjected to wash if the concrete is deposited correctly. A dry mix will pile up from the end of the tremie and permit a far greater loss of cement and the formation of laitance greatly in excess of that resulting from the wetter mix. Concrete mixed too dry or concrete allowed to mountain out from the tremie or bucket may prove so unsatisfactory that replacement will be the only solution. Concrete deposited by tremie or dump bucket should be carried forward rapidly as a continuous operation which will permit of the above mentioned methods.

A statement that the water used in mixing must be reasonably clear, free from oil, acid, injurious alkali, vegetable matter and shall not be salt, or even brackish, appears sufficient without comment.

Forms

A cold oven spoiled the bread. A poor form will spoil the finished product with the best of concrete.



Bridge Over New River at Ft. Lauderdale, Broward County.

Forms are never cheap. Some relatively cheap forms are many times more costly than the higher priced ones. A man with an axe, hammer, saw, and a pocket full of nails, and no experience, can spoil the best of lumber. Such unsightly results can be attained that it will require many times the added amount of wages of a good man to pay for the removal of the ear marks of the jackleg. Good workmanship is essential to satisfactory forms. Satisfactory forms are requisite for pleasing appearances and low finishing costs.

Forms should be unyielding, thoroughly braced against bulging, built water tight to prevent leakage of the mortar and constructed true to line and grade. There is but one assurance of unyielding forms when solid rock is not encountered. This so drive plies. Mud sills may or may not prove satisfactory owing to the possibility of under scour and settlement. Whatever type of support is used for the forms, camber equal at least to one-twentieth of an inch per foot of length of span, must be provided in the forms. A system of wedges should always be provided for wedging the forms to their true position as the concrete is deposited and settlement takes place in the forms. Sufficient elevations must be established to detect settlement. Correction for settlement should be made immediately upon detection. A method employed to tell by visual inspection whether settlement had occurred as the work progresses is to stretch a wire tightly between supports and below the wire at measured intervals and at equal distances drive a row of nails parallel to the wire. By passing a white cord around the nails the eye will detect the irregularities in the line prompting further investigation. Settlement at the several supports should be carefully investigated as the work progresses.

If settlement occurs in the forms, no one can question the clear and definite instructions to the engi-

neer and contractor alike, as to what is to be done. The work is to be first "stopped," next "the concrete is to be removed," this done "the forms are to be thoroughly braced and brought back true to line and grade." Work then and then alone may be permitted to proceed. Yielding forms not only result in unsightly structures but also result in the formation of cracks which will furnish just cause for the rejection of the work. It is far less costly to comply with specifications and make the adjustment in the forms while the concrete is green than it is to replace a unit after the concrete has aged.

Thin form lumber seldom, if ever, proves economical. The use of two-inch dressed lumber, tongue-and-groove or ship-lap, is urged unless a metal covering is to be provided to afford a watertight smooth surface. Forms should be oiled, or preferably paraffined. This must be done before the reinforcement is placed. Regardless of the oiling or paraffining, it is essential that the forms be thoroughly wetted down before any concrete is placed. Forms should not be framed and then allowed to stand out in the weather and warp. The joints will open. Dollars and cents of the contractor's money can well be saved by this precaution and prevented from leaking through these cracks.

The cutting back of the form wires and the subsequent patching back of the concrete, are slow and tedious jobs. The use of bolts wherever possible to replace the wires for tying the forms, is urged. The bolts can be turned soon after the concrete has taken its final set and can be easily removed at a later time. Holes left by the bolts are easily filled. The time saved, considered in terms of dollars and cents, will no doubt reimburse the contractor for any additional outlay for the bolts and the appearance of the work will be greatly improved by their use.

Mixing Concrete

By standing alongside the mixer and timing the period of mixing, one is apt to learn a thing or two. Field inspections, over a wide period of years, have indicated that the average time of mix will actually lie between thirty-nine and fifty seconds unless the inspector is wide awake. Years ago, the average specification on concrete indicated the length of mixing time as one minute. Following extensive experiments and numerous tests, it was found that a more uniform concrete would result from a longer mixing period. The period of one minute has been changed to one and one-half minutes in the greater majority of the more recent specifications. The mixing time is measured from the time all of the ingredients, including the water, have been placed in the drum and the actual mixing begun. Two very important things are accomplished by the longer period of mixing. The strength of the concrete is increased and less water is required to secure the proper consistency. In order to reduce this time, it has been constantly pointed out that an excess amount of water had been used. Many adverse criticisms of work can be eliminated by insisting upon the full period of mixing for each batch of concrete.

All mixers are not equally efficient. It is necessary to observe the mixer on each piece of work to determine just what is taking place. The speed of the drum in revolutions per minute should be first determined. It has been found on several occasions that separation of the aggregate appeared to occur during the final period of mixing. In such cases, if the drum speed is correct, it is necessary to adjust the blades to prevent this separation. A careful contractor keeps the drum of his mixer spotlessly clean. A clean mixer is essential to good mixing and also to the preservation of the machinery.

Construction Joints

Designs should also show the location of construction or field joints which may be permitted. No other joints should be allowed except by written permission or under the most unavoidable conditions. Lack of the proper equipment should never constitute a sufficient reason. The rated capacity of a mixer, a boiler, an engine or any machinery is usually expressed in terms of its capacity under most favorable conditions. No machinery can run for long periods at maximum capacity without breakdowns or shutdowns for repairs, and, if run to capacity the costs of operation are usually high. Such operation is neither economical for the contractor nor productive of the best results in the field. A reasonable decrease in rating capacity should be borne in mind when furnishing equipment for any work and sufficient equipment must be provided to continue the work in event of breakdowns.

Observation of work under construction convinces one that the top of the floor slab is an unsatisfactory location for a construction joint in a box culvert unless the water is so diverted that it will not flow through the box during construction. Horizontal construction joints in arched rings produce unsatisfactory structures. Construction joints between the floor slab and the stem of T-beams have resulted in a bad crack opening at the joint and destroying the T-beam section. Joints between the

curb and the floor slab add an additional place by which the water may enter, find its way to the steel and also stain the outside faces. None of the above mentioned joints should be permitted.

Handling Concrete

Concrete must be transported from the mixer to the place of final deposit without separation of the aggregates. If the aggregates are allowed to separate large areas of honeycombed surfaces will be the result. Permeable concrete also results because of the lack of the fine aggregate to properly fill the voids between the stones. Some methods of handling concrete are more productive of separation than others. Chutes should be avoided. When used, they should discharge into a hopper and the concrete be redistributed thence to the forms. Chuting directly into the form should not be permitted. When concrete is delivered through chutes it should slide down. This is to indicate that the coarse aggregate should never be permitted to roll. If the water content is kept a minimum, steep angle is required for the chutes and a steep angle usually results in the rolling down of the coarse aggregate. We have discussed already the necessity for keeping down the quantity of mixing water to a minimum. Adding water to permit chuting is not recommended if any other method of handling the concrete can be effectively used.

Wheeling concrete for long distances may be productive of a separation of the aggregates. If a rough run way is used separation almost always results. This detail should be carefully watched. Concrete buggies have been found more efficient for the handling of concrete than the use of the ordinary wheel barrow which is so often found on the work.

Retamped Concrete

The time of the initial and final sets of the different brands of cement vary. In order that no unsatisfactory concrete may find its way into the work, all concrete which has been mixed for a period of thirty minutes and not finally disposed, should be thrown aside and not used in the work.

Depositing Concrete

In placing the concrete in the forms of slabs, beams and girders, it should never be allowed to run ahead in a feather edge. Concrete containing the proper amount of water will flow ahead only under working. When the concrete is worked ahead on a diagonal plane, diagonal joints occur. These joints, if allowed to remain and harden before adding additional concrete may prove sufficient cause for the rejection of the unit since failures can be traced to the opening up of these joints. No period longer than fifteen minutes and preferably no period of appreciable length should elapse in placing the adjoining concrete. The concrete first placed should be thoroughly worked into the new in such a manner that no joint will be apparent. Care must be exercised in placing the concrete in the forms of T-beams and girders to prevent the dropping of concrete upon the slab forms and on the steel reinforcement. This concrete quickly dries out under the sun's rays and does not properly

bind to the concrete when deposited in the floor slab. Large areas often flake off under the blows of the inspecting hammer when such has been permitted or else give a hollow or dead ring often resulting in concrete easily removed to and beyond the reinforcing steel. At best, it provides a porous and very unsatisfactory protection for the steel. By providing hopper-like forms for the placing of concrete in the beams and girders, this condition is largely overcome.

Concrete in walls, beams, girders and slabs should always be deposited in horizontal layers. In arches, the joints should be radial and never horizontal. The concrete should be placed first at the center of the span and then deposited towards both ends in the case of beams, girders and slabs. Plans for arches should show the construction program which is to be followed. The placing of the crown section in arches first is urged. By beginning the pour in the center and completing the entire work, beams, girders, floorslab, and curbs in one operation the maximum deflections of the forms take place in such a way that the concrete, still green, will conform to the new curve of the form without developing cracks. If the concreting is begun at one end and settlement takes place, cracks may develop over the supports first poured. These cracks extend downward from the top of the floor slab or curb toward the bottom of the girder or beam. When such cracks are found, rejection of the work may ensue.

Too often laborers are found pulling the concrete from one portion of the forms to the other with hoes or spades. This should not be permitted. There appears to be little objection raised to this unsatisfactory detail. The pulling of the concrete plainly causes a separation of the aggregates and in addition works air into the concrete. When it becomes necessary to add concrete or to move it, the shovel should be entered beneath the concrete and the mass moved as a whole.

Requirements of Concrete

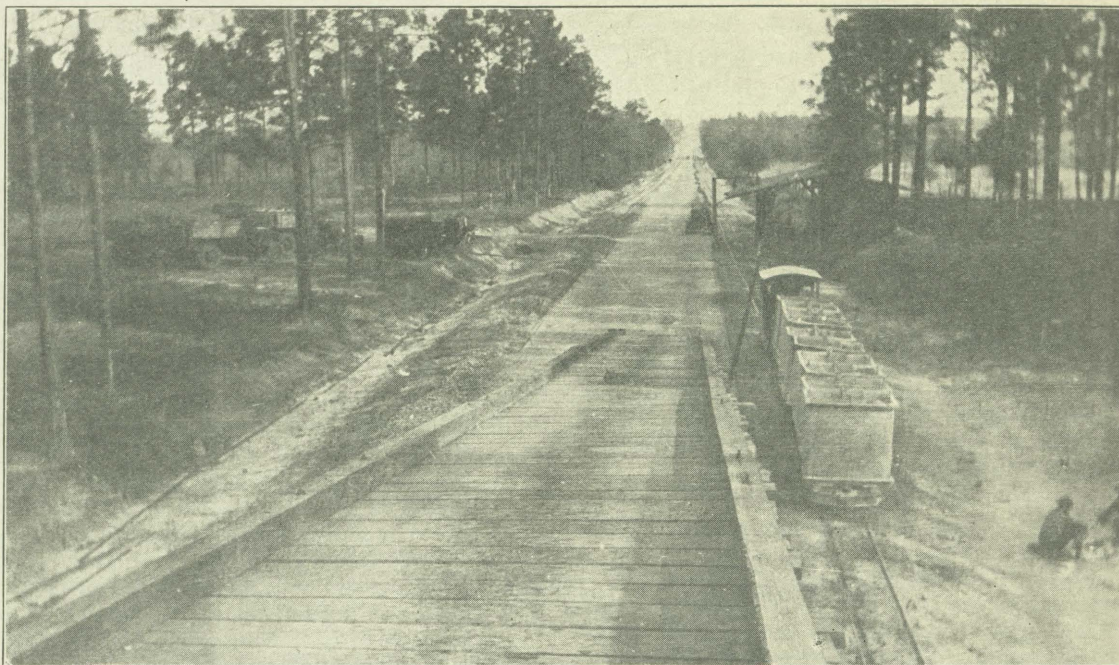
For concrete to withstand the ravages of time and weather, it must have strength, durability, density and must be impermeable. There is a difference between density and permeability. A dense concrete is not necessarily impermeable. Water may enter concrete by capillary attraction, may be forced in under pressure or a combination of pressure and capillary attraction. All concrete will absorb some water. It is only natural that a dense concrete will absorb less water than a porous concrete. The ability of the water to flow through or permeate the concrete by capillary attraction is dependent upon the character, sizes and arrangement of the minute channels connecting one pore with the other and with the exterior surfaces of the concrete. Thus we indicate the difference between the two terms. Either porous concrete or concrete through which water will permeate is unsatisfactory and especially so for reinforced concrete since it would permit the early rusting of the steel. Since rusting of the steel is accomplished by the spalling off of the concrete, ultimately these conditions result in the destruction of the structure. Spading and tamping make concrete more dense and more nearly impermeable.

Spading and Tamping Concrete

For a long period of years, the making of concrete was a lost art. Following the days of wet, sloppy concrete, the art of puddling, spading, and tamping concrete seems to have been forgotten and apparently is hard to revive. A large majority of the faulty concrete construction can be traced to a neglect of proper spading and tamping. Too much stress cannot be laid upon these essentials. Tools for spading the concrete should be thin in design and of such a width that they may be lowered between the reinforcing bars. Handles which will pass between the forms and bars must be provided. The handles of ordinary garden hoes which have been straightened out appear too large for reinforced concrete work. Oblong or circular openings should be provided in the spading tools to permit the mortar to flow back and forth as the tool is used. A flat tamper, square in shape and provided with a wooden handle, is very efficient for use above the steel in tamping slabs and curbs or tops of girders. In addition to the spading and tamping, forms should be lightly hammered on all exposed surfaces and bottoms of beams and slabs, to prevent the formation of air or water pockets. The whole idea of tamping, spading and hammering is to consolidate the concrete.

Under-water Concrete

The subject of depositing concrete under water has been touched upon under the consideration of mixing water. A discussion of the relative advantages of the different types of cofferdams, the outlining of equipment required for this class of work and a discussion of the many problems presented would consume the full time allotted. Nearly every job has some water work to be performed and two very necessary details should at least receive a few words. The cofferdam must always be constructed larger than the finished lines of the structure in order that forms may be set and working room provided. In addition, under no circumstances should the sump of the pump be within the forms and the pump allowed to suck the cement from the concrete deposited. It is, therefore, necessary that the cofferdam be constructed sufficiently large to allow a sump for the pump outside of the form line. Never begin unwatering until every detail is complete for the rapid progress of the work. Never start with broken down pumps or pumps working to capacity. Pumps should at all times be adequate with a full margin in reserve to care for the many leaks which will develop. Auxiliary pumps should be at hand for use in case of break-down. Water work to be successful must be done quickly. Untold damage can be done by unwatering a cofferdam and permitting it to stand open and by allowing it to fill again and then unwater. Each unwatering strains the braces, causes leaks to develop and may finally start a blow at the bottom of the dam. A contractor who permits water work to drag cannot hope to make a profit. The engineer should insist upon preparation with no delays. A seal is necessary in some work. Never take a risk with a seal but put in the full figured amount even though you feel that it is playing too safe. I have in mind a three-foot seal which should have been nine feet. This cost approximately five thousand dollars to rectify. It would have cost



Project 27-A, Road No. 2, Columbia County. C. F. Lytle, Contractor.

a few hundred dollars to have put the seal in for forty-five hundredths of the total depth of water measured from the bottom of excavation to the top of the water surface. In placing seals, the concrete can be deposited through tremie or by means of a bottom dump bucket. When piles have been driven and the seal is to be deposited around them, a tremie is to be preferred. For all other cases, a bottom dump bucket is to be preferred.

Reinforcement

Reinforcement should be carefully placed, accurately spaced and thoroughly wired together. It should be raised to its correct position within the form before any concrete is placed. The use of metal supports for the reinforcing steel is not recommended. Wooden blocks in the olden days were used in quarrying to break granite blocks. If wooden blocks are used to support the reinforcement and then not removed, we should anticipate similar action in the concrete. Wedge-shaped concrete blocks with the wide base in contact with the reinforcing steel, are suggested for raising the steel into position above the forms. Continuous lines of these blocks should not be used across the entire width of slab. The blocks of concrete must be thoroughly cured and no blocks of porous, dead concrete should be permitted. Greasing or oiling the steel to prevent rust, must not be tolerated. The steel must be reasonably clean and free from rust and mill scale. The necessity of bending bars and spacing them accurately in accordance with the plans, should need no further comment.

Concrete Piles

Concrete piles are becoming more generally used and especially the pre-cast type of pile. The use of

light hammers for the driving of concrete piles usually results in badly shattered heads. The heaviest equipment obtainable should be employed. Steam hammers are greatly to be preferred. A steam hammer whose striking part weighs 7,500 pounds is preferred for piles of longer length. If the soil is of a sandy nature, water jets should be provided, not less than two in number. Concrete piles can be driven where, no doubt, wooden piles would not penetrate. Once a concrete pile is in place it cannot be pulled over without extreme danger of cracking the pile. Concrete piles must be handled at two or more points of support to avoid cracking in the handling. They should never be permitted to drop or to be piled at random one over the other. Every precaution possible is none too much to insure the driving of the pile without cracks. Special protection of the head by wooden blocks, old pieces of automobile casings or rope coils must be provided.

Curing Concrete

The check cracking of mud under the heat of the sun, is a familiar sight. Concrete will check crack also and must be protected from the direct rays of the sun as soon as it has been deposited. Tarpaulins for the covering of handrails have proven effective, the handrails themselves being thoroughly wetted three or four times each day. A sand-clay or sand-clay and Spanish moss covering on slabs and curbs when wetted not less than three times a day, is satisfactory. The coverings must be kept wet for the full period indicated in the specifications.

In this section of the country, freezing weather is not often encountered. Special precautions to protect the concrete in such weather is necessary. Since the duration is for a very short period, it is believed advisable to discontinue the work during such a period and to protect the green concrete by bon-

fires built on the windward side to prevent the new concrete from freezing.

Removal of Forms

If the oven had been overheated when the first pan of dough was placed, it is probable that the outside surfaces would have crusted hard while little effect of the heat would have been noted in the center of the loaf. A slow cooking bakes the loaf done. Now concrete takes time to cure through and through. For this reason, the forms which carry no weight may be pulled in about forty-eight hours to seven days, depending upon their location, while the forms and supports carrying the weight of the structure must remain in place from twenty-one to twenty-eight days. Suppose that we pull the forms earlier, many men have done so in a week or so and have also turned traffic over apparently with no harmful effects. If the concrete has not had sufficient time to thoroughly set up, failure may occur when the forms are removed or at least cracks develop in the crust which would necessitate the wrecking of the structure. Vertical forms should not be held in place any longer than essential. It is necessary to remove forms at the earliest possible moment to effect a satisfactory finish at a reasonable cost. Both the engineer and the contractor should bear this point in mind.

Finish of Concrete

The plans should specify the finish which is to be obtained. If a natural finish is specified, it does not mean that the fins of concrete are not to be carefully removed, all water pockets neatly and carefully filled and the work rubbed sufficiently with a wooden float or brick to present a neat appearance. All holes must be thoroughly sealed and the surfaces made true to present an uniform appearance. All wires should be cut back at least one-half inch and the concrete neatly patched where the wires have been removed. If rubbing has been necessary on a portion of a span or one span of a bridge it should be continued throughout the entire structure in order to present an uniform appearance. Rubbing in no case should be carried to such a depth that the carbonic skin of the concrete is destroyed. If honeycombed surfaces exist, they must be cleaned out to solid concrete showing no voids. The surface of the solid concrete must be drenched and kept drenched for at least three days before repairs are attempted. The old concrete must be thoroughly roughened up for bond. Immediately before beginning the patch which should be made of a stiff mortar mixed in the same proportions as the mortar of the original work, the cavity should be swabbed with a thin mortar of neat cement and water. It is necessary to keep the patch drenched for at least three days to prevent as far as possible, contraction cracks. A similar method should be followed in beginning a new work in which construction joints have been permitted. The bonding of new work to old, is a most difficult undertaking.

Inspection of the Finished Work

The structure has now assumed its final shape. What have we to offer our client? The eye will quickly vouch for the alignment and grade and the

freedom from bulges and sags. An April Fool cake with its cotton filling looks good enough to eat. It is about as satisfactory to buy a second hand automobile by its paint as it is to accept concrete by visual inspection alone. We all are aware of the fact that many a poor car has been bought on its paint.

If the center in the concrete structure is good, it is hard to break into regardless of tools. There is little need to fear the telling inspection of a little, light, seven ounce inspecting hammer if the work has been properly tamped and spaded. But woe to the structure with honeycombed areas, voids and soft, unsatisfactory aggregates. A few strokes of the hammer will usually tell the tale. Sound concrete gives a clear ringing sound with almost a metallic ring. A more or less dead concrete resulting from excess water in the mixing, porous concrete, and concrete with voids back of the outside skin of mortar are told by their sounds and appearances. A dead concrete as well as a porous concrete gives a dead sound lacking the ring and the sound of the hammer is more or less like a thud. Concrete which contains voids back of the skin rings hollow. The difference in sound between good and poor concrete is somewhat similar to the difference in sound of a kettle drum when the head is taut and after exposure to dampness. The hammer test is not to mar, scar or tear down the work. It is used to aid in finding poor concrete and after finding the defects for the purpose of finding how deep into the structure such a condition extends. All surfaces must be thoroughly gone over. The bottoms of slabs, beams and girders very often reveal the worst condition. A thin mortar which may appear as sound concrete to the eye may be found to ring hollow and back of this shell to hide large areas of honeycombed and permeable concrete. The eye will detect porous concrete while the hammer will disclose concrete through which water may permeate. Either class of concrete has been shown to result finally in the early deterioration of the structure. Every void and minute hole appearing on the surface must be explored to the depth of sound concrete.

Conclusion

In the beginning, the relationship between the engineer and the work was called to your attention. The fact was stated that there must at all times be full and thorough cooperation between the engineer and the contractor. Cooperation between the engineer and the contractor does not imply intimate personal relationship. An absolute respect one for the other, is essential to full cooperation. Where the work is concerned, their relationship should be such that all personal interests will be wedded together for the good of the work. An illustration to express such a combination of interest may not be amiss.

Two veterans each lost a leg in the war, one his right, the other his left. They met for the first time in the hospital and became friends. Both were discharged at the same time. Separately they made their way to a shoe store. Neither needed a pair of shoes. Luckily they met at the store. Getting together, they combined their wants into one pair of shoes saving money for each other. One took the right, the other the left. They departed smiling and happy.

"Black Base" Highway Construction

By GEORGE W. CRAIG, C. E., Chicago, Illinois

Paper Read Before the Sixteenth Annual Convention of the Engineering Society of Wisconsin, Feb. 21, 23, 1924

It has often been said that there are two schools of thought in the matter of suitable foundations for wearing surfaces of various types of pavements that are now commonly used, that is the rigid base and the flexible base. In directing your attention to the latter, the flexible types, it will be necessary to point out that these types have been in use successfully from the inception of our modern-day paving construction. The use of macadam, graveled and bituminous foundations for suitable wearing surfaces have been used to much greater extent than is generally supposed. It is not uncommon in some of our older cities to find pavements that have been in service from twenty-five to forty years, which have natural cement concrete foundations in which the cementing properties have long ceased to exist, and with but rare exception the contour and alinement of these old pavements compare most favorably with the latter day rigid type of construction.

Many other types of flexible or non-rigid foundations have been in constant use, notably well compacted or old macadam, gravel roads, and bituminous or black base foundations laid upon either of the above-mentioned materials or black base laid directly upon the natural sub-grade. The freedom of the flexible types of pavements from transverse cracks and other disintegrations due to expansion and contraction within the base or sub-grade is evidenced to a marked extent; in many instances there is an utter absence of these objectionable features.

Most competent paving authorities are devoting a great deal of attention to the subgrade. The research work that is being carried on by the U. S. Bureau of Public Roads, the State Highway Department of Illinois under the able direction of Mr. Clifford Older, and the work of the Pittsburgh road tests in California, all point to a careful consideration of the sub-grade problems. Many features brought out in these investigations have clearly demonstrated that too little thought has been given to the subject of sub-grade. These conclusions are equally applicable both to the rigid and flexible types of pavements. It is generally conceded that greater attention should be given to the preparation of the sub-grade rather than increasing the strength of the pavements. We are agreed that the bearing power of soils under different conditions vary greatly; that the moisture content has a marked influence, but by careful attention to the matter of drainage and the use of certain admixtures of other materials, such as sand, gravel, etc., the value of this variable is materially reduced. It is known that the expansion of soils due to capillarity is greater at some seasons of the year than others. With these conditions as stated it is believed by many that the flexible type of base is preferable. An attempt will be made to prove

later in this discussion by citing numerous examples that this preference is justified.

In the use of black base uniform contact with the subgrade constantly exists and in this way a greater uniformity of load distribution is secured throughout the entire structure. It is reasonable to assume, from the California experience and certain results obtained from the research work mentioned, that a considerable portion of the moisture which is contained in the subgrade is transmitted vertically either downward through the surface of the pavement or from below by capillarity, or both. A well constructed black base pavement can be said to be waterproof, thus shutting off water that may come from the surface, and by using fine sand or other suitable materials in the subgrade, where necessary, the effect of capillarity can be practically eliminated.

In designing a black base pavement for such conditions as are mentioned the writer does not lose sight of the fact that it is possible for subgrade conditions to be unfit for this type of construction, and it can also be said that this would be equally true for all other types of pavement. In other words, there is no type of pavement that can be considered a panacea for all ills. Expert advice is too often overlooked to the detriment of the best interests of the paving industry.

The application of black base construction in the surfacing of existing Telfords, macadam and graveled roads has a wide field in addition to the use above stated. The abandoning of these types of highways for more stable pavements is due almost entirely to the fact that such types are no longer economical on account of excessive maintenance and lack of smoothness. Although these types will not withstand the ravages of rubber-tired traffic as surfaces, they are, with a few exceptions, amply able to carry the load requirements. At certain seasons of the year sections of these types of pavement become unstable due to saturation and frost action. Due to the fact that such structures are porous, the moisture from snow, water and rains penetrate through these materials and thus cause an unstable subgrade. Black base is the most water-proof of all modern pavements, and it can be said that water will not penetrate through this type of pavement.

Mr. Chris P. Jensen, member American Society of Civil Engineers, in a paper entitled "The Use of Asphalt Concrete in Pavement Bases," presented at the Asphalt Conference at Denver, Colo., August, 1923, in summing up his discussion on subgrade, says:

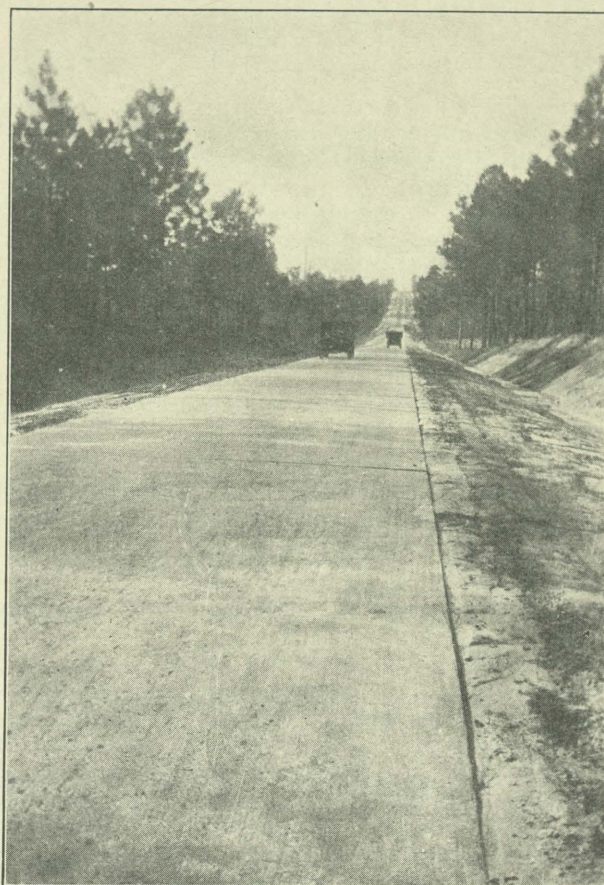
"On an adequate subgrade, an asphaltic concrete base has ample stability to transmit the heaviest loads. Properly constructed asphalt concrete has a specific gravity equal to, or better than, the specific

gravity of the usual hydraulic concrete. We have attempted to show, as a result of tests heretofore made, that asphalt concrete absorbs more of the shock of impact and transmits less of the same shock to the subgrade; it is only fair to assume that the angle of impact diffusion would be the same in both classes of pavement. It is therefore highly reasonable to assert that the same, or a less thickness of asphaltic concrete will perform the same duty as a given thickness of hydraulic concrete."

Examples of black base construction are to be found in many localities throughout the United States and Canada. A notable example is the north side of Washington Street, Chicago, Ill., immediately adjoining the Marshall Field stores. Here has existed since 1911 a black base pavement laid directly upon the natural subgrade. This pavement is within the loop district with unrestricted traffic regulations; also the areaway between State Street and Wabash Avenue stores of Marshall Field & Co. is another example which has cost nothing for maintenance in twelve or thirteen years. It is believed that this street is subjected to as heavy traffic as any thoroughfare in this country. The present condition of this pavement compares favorably with any and surpasses many other sections within the loop district.

Selecting examples in widely scattered localities—Visalia, California, has a black base pavement on the main street that was laid in 1894 directly upon the native subgrade. Reports to date indicate that no repairs have been made. In this same locality there exists on the principal highways considerably more than one hundred miles of black base laid directly on the subgrade, some of which were laid many years ago.

The continued use of this type of construction in new work would indicate its serviceability. Portland, Oregon, has had a continued growth of black base until there exists in that city at the present time more than two hundred thousand yards. Calgary, Canada, with the most severe climatic conditions, has many thousands of yards; Ontario highways several miles; Omaha, Neb., pavements of twenty years or more of service; Florida, North Carolina, Massachusetts, Delaware, Washington, D. C.; Maryland, Owensboro, Ky., and Decatur, Ill., Brush College road built last year. Flexible base pavements, including black base and macadam, compose almost the entire boulevard system of the city of Chicago. The portion of the boulevard system known as Michigan Avenue carries perhaps as dense traffic, including heavy motor buses, as any boulevard in the United States. It can also be said the other portions of the boulevard system are heavily taxed with traffic. Many other cities have adopted this type for street construction. Similar resurfacing of graveled streets and roads has also kept pace with the others., Grand Rapids, Mich., successfully using less thickness of black base than is usually recommended. Some of these streets, so paved, have been in existence from ten to thirteen years, with maintenance charges practically nill. The Michigan State Highway Department has directed that a section of about eight miles be constructed near Lansing. West Virginia has also adopted the same type and authorized the



Project 27-A, Columbia County—New Concrete Road.

construction of about five miles. The State of North Carolina, with its sand asphalt roads also constitutes another notable example.

Conclusions:

1. The first cost of black base types of pavement compare most favorably with other types.
2. Black base requires the use of mineral aggregates that are commonly used in rigid types of construction.
3. The average maintenance costs are the lowest of any type of the so-called permanent class of pavement. The present-day method of surface heating makes repairs economical and substantial, at a low cost.
4. Provides intimate contact with the subgrade, thus preventing displacement of the sub-soils, and also providing maximum value as a distributing medium.
5. Black base being a homogeneous mass, is of such a character that it readily unites with the bituminous surface and with a positive bond.
6. Provides against objectionable cracks and other defects that are associated with the rigid type of base.
7. With examples of thirty to forty years' duration which are now in existence, long life can be reasonably expected.
8. Quickness of construction provides against tedious delays and long curing periods, thus curtailing the prerogatives of Old Man Detour.

OVERBURNED LIME CAUSE OF "POPPING" IN PLASTER

Lime which has been overburned or which has been burned during hydration is the cause of popping in plaster, tests made at the Bureau of Standards have shown. In this type of failure small particles appear to expand and push themselves out of the plaster, leaving tiny holes. In extreme cases these holes may be sufficiently large or numerous to be unsightly. It has been shown that popping will not be serious if the lime is ground fine enough to pass a number 50 sieve, as in that case the lime will be completely hydrated during the mixing and application, or else the particles of defective lime will be too small to cause noticeable holes.

RUBBER PAVEMENT TO BE TESTED IN RACINE, WISCONSIN

Racine, Wisconsin, will test a section of rubber pavement twenty feet in width and seventy-five feet in length on Main Street directly in front of the Racine postoffice where traffic is the heaviest.

While rubber block has been used in England for short sections of pavement, this will be the first test ever made for regular street purposes in America. The rubber blocks for this purpose will be made by the Goodrich Rubber Co. This type of rubber block was designed originally for railroad grade crossing purposes.

A bill has just been introduced in the House of Representatives by Congressman Fenn, of Connecticut, providing for a national system of motor vehicle registration. The proposed law is designed to provide a uniform, co-operative method between States and the National Government by which a check can be kept on the identification of every motor vehicle manufactured after the passage of the bill.

The measure is framed as a tax bill, by which a tax of fifty cents would be levied upon every transfer, mortgage, or hypothecation of any motor vehicle.

At the present moment it is not possible to find that the bill will be given serious consideration in the near future.

It would provide some wonderful new desk jobs at Washington if the bill ever passed. Think of one bureau handling the 10,000 registration certificates that would arrive each business day.—American Motorist.

WHERE THEY FAILED

Napoleon never voted the prohibition ticket.

Oliver Cromwell never rode in an automobile.

Jeanne d'Arc never rode on the rear seat of a motorcycle.

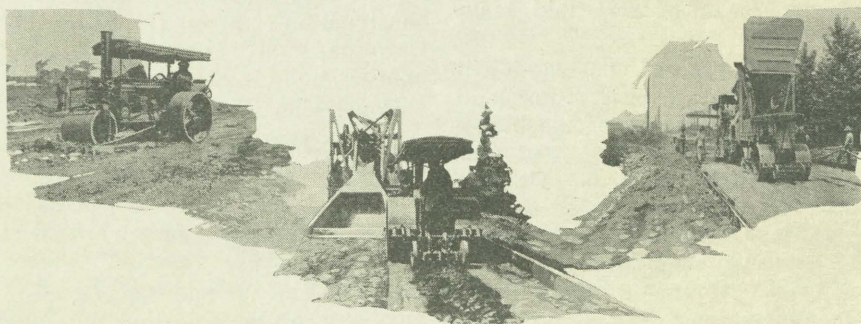
Cleopatra never wore a union suit.

Julius Caesar could play anything but pinochle.

The Queen of Sheba never had to stand up in a street car.

Nero never tried to blow out the gas.

—Literary Digest.



Planing an exceedingly hard, rough subgrade.

Scarifying a ridge.

No concrete wasted here.

Save on the Subgrade with an Austin Pup

THE AUSTIN PUP was literally "made-to-order" for builders of concrete roads, and many of the country's most progressive contractors are numbered among its most enthusiastic boosters. These photographs of an Illinois State Road job show how the planing blade and scarifier, and finally the roller, will turn a hard, rutted subgrade into a smooth, true, compact one; will do it quickly, easily and inexpensively; and, finally, will save the concrete that otherwise is wasted in filling irregularities and the ruts left by the trucks.

A special catalogue tells all about this three to four ton, one-man machine that does anything and everything that an elaborate outfit costing five times as much to purchase and operate will do. We would like a chance to prove to you that you really can not afford to be without at least one Austin Pup.

The Austin-Western Road Machinery Company

Factories and Home Office, Chicago, Illinois

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115 Marietta Street, ATLANTA, GA.

Northern and Southwestern Florida Representative

ROSCOE KENT,
Orlando, Fla.

East Coast Representative,

L. D. LLEWELLYN, Suite 214, Bedford Bldg.,
Miami, Fla.

U. S. Supreme Court Hands Down Important Motoring Decisions

Arkansas Gas Tax and New York Compulsory Liability Insurance Laws Are Constitutional

The United States Supreme Court has just handed down two important decisions of interest to motorists.

The State of Arkansas, as a result of one ruling, can continue to collect four cents tax on every gallon of gasoline sold in that State, as the law levying this heavy tax upon motor vehicle users does not violate the provisions of either Federal or State Constitutions. The State Courts recently decided this as far as they were concerned and now comes the United States Supreme Court with a decision upholding the Federal constitutionality of the law.

The State of New York, according to the second decision, can continue to require persons engaged in carrying passengers in motor vehicles for hire in first class cities, such as New York, Buffalo and Rochester, to provide an indemnity bond or carry liability insurance to the amount of \$2,500 to satisfy accident judgments. The law is not applicable, however, to privately operated vehicles. Neither does it apply to omnibusses subject to the Public Service Commission.

District Court Refuses to Enjoin State

The decision of the United States Supreme Court as to the gasoline tax in the State of Arkansas was had in an appeal from the decision of the United States District Court which refused to enjoin the State of Arkansas on behalf of the Pierce Oil Corporation from the collection of the tax of one cent per gallon on gasoline. The United States Circuit Court of Appeals affirmed the decision of the lower court and the plaintiff carried it to the United States Supreme Court. Since the litigation was started the tax on gasoline has been increased to four cents with an additional tax of ten cents per gallon on oil.

In the Arkansas case the validity of the law was challenged under both the State and Federal Constitutions. The highest court of the State upheld the law, in so far as the State constitution was concerned, in another case while the present case was pending in the United States Supreme Court. In the latter court the argument was made that the tax levied is a privilege tax for the use of the highways by the purchasers; that the seller of gasoline is required to pay the tax laid on the purchasers; that, unlike certain other taxes, the seller is not afforded the means of reimbursing himself; and that, moreover, the mere process of collecting the tax from the purchaser, and making monthly reports and payments, subjects the seller to an appreciable expense.

A short answer to this argument, the United States Supreme Court said, is that the seller is directed to collect the tax from the purchaser when he makes the sales; and that a State, unless restrained by its own constitution, has the power to regulate the business of selling gasoline and also the power to tax the

privilege of carrying on that business. In doing this a State is not prevented from imposing the incidental burden. A question raised in this case as to the uncertainty of the law, was settled by the State court in another case, which construed the law to apply only on such gasoline as the sellers have reason to believe is purchased for use in motors on the highways.

The Compulsory Liability Insurance law of New York, as it is called, was enacted by the General Assembly in 1922.

It requires every person engaged in the business of carrying passengers for hire in any motor vehicle to file with the State Tax Commission, either a personal bond with sureties, a corporate surety bond or a policy of insurance in a solvent and responsible company in the sum of \$2,500 to satisfy any judgment recovered for death or injury caused in the operation or defective construction of such motor vehicle. The law applies only to the cities of the first class, i. e., New York, Buffalo and Rochester, and does not apply to omnibusses subject to the Public Service Commission law.

William Henry Packard, who is not connected with the manufacture of an automobile of that name, filed suit against District Attorney Banton and Attorney General Newton of New York to enjoin the enforcement of the law, which his counsel alleged to be in contravention of the Federal Constitution. It is understood that Mr. Packard represented the interests of taxicab drivers.

Discriminating Against For-Hire Cars Charged

The main contention in the litigation was that the law unreasonably and arbitrarily discriminated against those engaged in operating motor vehicles for hire in favor of persons operating such vehicles for their private ends, and in favor of street cars and motor omnibusses. In support of this argument the taxicab drivers alleged that the premium for the required policy is fixed by the insurance companies at \$960, and that the net income from the operation of a motor vehicle is about \$35 a week, which would be reduced by the operation of the law to \$16.50 a week, resulting in confiscation of the earnings of the drivers for the benefit of the insurance companies. Counsel for New York, however, contended that insurance policies in mutual casualty companies may be secured for \$540 a year, and that operators of upwards of a thousand cars have furnished personal bonds.

The federal court in New York was not persuaded by the arguments of the complainants, for it dismissed the proceeding. Thereupon an appeal was taken to the Supreme Court of the United States, which, after due consideration, agreed with the lower court.

(Continued on Page Twenty)

Status of Road Construction

THROUGH FEBRUARY 29TH, 1924.

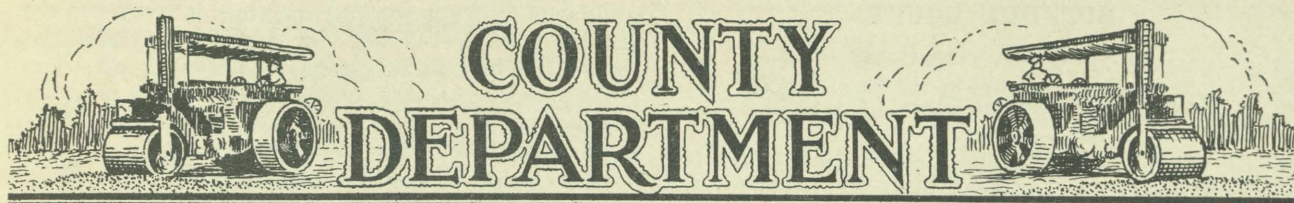
Proj. No.	Contractor.	Road No.	County.	Type.	Total Length.	Pct. Complete.
18	Morgan-Hill Paving Co.	3	Putnam	B.M.	12.8	99.0
27-A, B	C. F. Lytle	2	Columbia	C.	12.36	81.9
32	State Forces	4	Nassau	B.M.	10.00	87.5
34	Union Indemnity Co.	7	Escambia	C.	10.00	49.0
35	Hancock Bros.	1	Escambia	C.	5.00	99.9
36-A	H. L. Clark & Sons	4	St. Lucie	B.M.	7.76	60.5
36-B	C. F. Lytle	4	St. Lucie	C.	7.12	8.5
37-A	F. W. Long & Co.	2	Alachua	S.A.	.70	2.0
37-C	F. W. Long & Co.	2	Alachua	S.A.	3.26	21.9
37-D	Fla. Drainage and Const. Co.	2	Alachua	G.&D.	2.14	0.00
37-E	Wm. P. McDonald Const. Co.	2	Alachua	S.A.	7.96	27.3
40-A	C. F. Lytle	4	Brevard	R.	16.17	0.0
40-D	J. Y. Wilson	4	Brevard	R.	6.72	.002
40-E	Langston Const. Co.	4	Brevard	R.	13.60	.003
501	State Forces	6	Calhoun	S.C.	41.19	93.0
503	State Forces	2	Charlotte	G.&D.	8.7	90.0
504	State Forces	1	Columbia	G.&D.	9.15	100.0
505	State Forces	2	Columbia	S.C.	11.8	78.6
507	The Barber-Fortin Co.	4	Flagler-Volusia	R.	10.0	70.0
515	State Forces	20	Jackson	S.C.	16.6	99.0
518	County Forces	29	Lafayette	G.&D.	15.0	0.0
519	State Forces	5	Manatee	B.M.	3.5	36.0
521	Morgan-Hill Paving Co.	4	Nassau	R.	12.41	0.0
523	M. J. Cole (County Funds)	8	Okeechobee	B.M.	8.75	48.1
532	State Forces	3	Volusia	B.M.	18.32	85.0
534-A	J. D. Donahoo & Sons	24	Brevard	R.	2.65	34.0
534-B	Noll & Noll	24	Brevard	R.	11.85	46.0
536	County Forces	1	Gadsden	S.C.	5.5	89.0
538	State Forces	2	Marion	R.	10.92	75.0
539	County Forces	5	Marion	R.	11.3	18.5
544-A	F. S. Whitney	5	Pasco	R.	8.75	8.0
544-B	The Barber-Fortin Co.	5	Pasco	R.	11.33	.095
545	Broadbent & Groeting	5	Hernando	R.	9.51	17.3
553	State Forces	2	Marion	R.	9.15	13.3
554	The Barber-Fortin Co.	4	Brevard	R.	5.0	90.0
560	State Forces	6	Calhoun	S.C.	20.0	60.0
562-A	Southern Surety Co.	8	Highlands	G.&D.	5.37	25.3
562-B	W. P. Kennedy Const. Co.	8	Highlands	S.A.	10.71	55.0
564-A	Edgar Chapman (County Funds)	5	Charlotte	G.&D.	10.88	0.0
564-B	Boone & Wester	5	Charlotte	G.&D.	10.31	95.0
565	State Forces	1	Madison	S.C.	15.64	64.0
570	Morgan-Hill Paving Co.	5	Manatee	B.M.	3.96	69.3
571	Hunter & Gladwell	1	Madison	S.C.	14.73	12.0
572	L. M. Gray	13	Bradford	R.	7.3	0.00
572	State Forces	13	Bradford	G.&D.	7.3	100.0
574	State Forces	9	Madison	S.C.	11.66	30.0
575	State Forces	3	Putnam	R.	5.46	25.2
576	S. T. Buchanan & Son	5	Sarasota	G.&D.	5.68	0.0
577	County Forces	19	Taylor	R.	9.732	62.0
579	State Forces	1	Holmes	S.C.	8.62	69.0
584	Noll & Noll	24	Osceola	Brick	2.00	98.6
586	State Forces	1	Jackson-Washington	S.C.	17.37	23.8
589	County Forces	5	Lee	R.	8.27	38.0
594	State Forces	13	Bradford	G.&D.	9.095	83.0
594	L. M. Gray	13	Bradford	R.	9.095	0.0
596	State Forces (Carried as Maint.)	10	Leon	R.	3.0	50.0
597	J. Y. Wilson	4	Volusia	R.	16.24	.028
598-A	Walter J. Bryson Paving Co.	1	Jefferson	S.C.	9.45	6.0
599	M. M. Boyd	2	DeSoto-Charlotte	G.&D.	7.10	10.0
604	C. F. Lytle	4	Volusia	R.	7.72	.002
605	State Forces	8	Polk	Rk. sh'lders	21.0	0.0
607	State Forces	13	Bradford	G.&D.	5.10	47.0
607	L. M. Gray	13	Bradford	R.	5.10	0.0
608	State Forces	4	Brevard	R.	9.29	3.09

TOTAL MILES COMPLETE

	Conc.	Brick	S. Asph.	Bit. Mac.	Rock	Sand-C.	G. & D.	Total
Completed January 31, 1924	68.62	24.89	58.00	138.77	68.30	244.78	178.00	781.38
February, 1924	4.20	.22	2.95	2.41	8.69	14.35	8.49	41.31
Total February 29, 1924	72.82	25.11	60.95	141.18	76.99	259.13	186.49	824.69

Note—The above tabulation shows only those projects that are actually under construction at the present time and does not show projects that have been previously completed. However, the table, "Total miles completed," at the foot includes all projects that have been completed prior to February 29th, 1924, and the amount completed in February also. The abbreviations used are as follows:

C—Concrete. S.A.—Sheet asphalt. B.M.—Bituminous macadam. R.—Rock base. S.C.—Sand Clay. G.&D.—Graded and drained.



MARION COUNTY ROAD SYSTEM TO BE BEST THAT CAN BE BUILT

Ocala, March 25.—Marion County will have one of the best highway systems in Florida under the plans outlined for submission to the qualified electors who will on April 30 vote on a proposed bond issue of \$1,500,000, according to surveys made by County Highway Engineer J. E. Walker. The proposed system called for in the bond proposal includes nine projects with a total of 137 miles, which will be in addition to State Roads Nos 2 and 5, now under construction through the county. Including the two State roads, the total mileage in the county will be 194.

It is proposed to build six of the roads sixteen feet wide, with compacted limerock base with a surfacing of slag and asphalt or tar; two of sand-clay, sixteen feet wide and one of compacted limerock, nine feet wide, with surfacing. The system will give the county a network of highways reaching out through every section and connecting with the important lines of travel in adjoining counties. The system is so planned that it lends itself in a practical way to the building of laterals at a later date.

The highways named in the call for the election, and which must be built with the proceeds of the bonds, are: Bellevue to Sumter County line; Ocala to State Road No. 5, near Juliette, via Martel; State Road No. 2, near Zuber, to Levy County line near Morriston, via Emathla and Blitchton; State Road No. 2, near Orange Lake to Levy County line, near Williston, via Irving and Flemington; Ocala to Alachua County line, via Anthony, Sparr and Citra; Ocala to Ocklawaha river at Delk's Bluff via Silver Springs; Ocklawaha river at Delk's Bluff to Lake County line near Astor via Lynne; State Road No. 2 at Weirsdale to Lake County line at Altoona, via Sharpe's Ferry; Ocala-Delk's Bluff road to Putnam County line, via Fort McCoy and Orange Springs.

Construction work is going forward rapidly on State Roads Nos. 2 and 5 through the county. From the Alachua County line to Lowell, eleven miles, on State Road No. 2, the lime rock base is down and material is on hand for surfacing. From Lowell into Ocala is a federal aid project on which a contract will be let as soon as condemnation proceedings for a right of way at Kendrick have been completed. Between Ocala and Bellevue, the grading has been completed almost into Ocala. The lime rock base is being laid from Santos south to Bellevue and the county engineer expects to have the base completed to Bellevue by the middle of April and into Ocala sometime in July. From Bellevue to the Lake County line, the highway is completed with base and temporary surfacing of asphalt and slag. The grading of State Road No. 5 from Dunnellon to the Levy County line near Romeo, is completed and the lime rock base is being laid from the Dunnellon end, and will be completed sometime in July, it is expected.—Florida Times-Union.

PENSACOLA HAD SATISFACTORY YEAR

It is largely due to the construction work carried on during the year just past that the U. S. Department of Commerce was able to base its observation relative to Pensacola, Fla., and the resort towns in its vicinity—that the employment situation remained thoroughly satisfactory.

Construction in this section, while by no means startling as regards the amounts involved in individual projects, was an important factor in maintaining in this section of the State, that distinction accruing to Florida from her excellent general economic condition, for which she was unsurpassed among all the States.

Highway building, particularly with reference to Escambia County, of which Pensacola is the county seat, has been the branch in which the largest amounts were expended. Yet hotel buildings and improvement, the erection of places of business and homes, and improving of industrial facilities, were also prominent activities in the construction line.

With three millions of dollars available in this county alone, road building has been carried forward with the greatest possible expedition. The Pensacola Gulf Beach highway, the Pensacola-Flo-maton highway, and the Pensacola-Nunez ferry highway, are the most important projects in road construction during 1923. Up to Nov. 24 the amounts expended on these projects were respectively \$404,000, \$250,325, and \$129,246.

Sixteen months were required to complete the construction of the most important of these roads, the Pensacola Gulf Beach highway, West Florida's premier scenic drive, which is a stretch of fine concrete road running diagonally from the city proper to a point seventeen miles distant, onto the snow white sands of the Gulf of Mexico. It was mainly in 1923 that work on this road progressed, for during the early months prohibitive weather, coupled with the irremediable delays of material shipments accompanying the unsettled transportation situation of those months often made it impossible to proceed with the work during those months of the contract which came in 1922. Speed-Parker, Inc., of Louisville, Ky., were the contractors on this job.

At the beach terminus of this highway the same firm of contractors are now well on the way to the completion of a concrete parking space, which when finished, will approximate a quarter of a mile in length. The construction of this addition to the Pensacola Gulf Beach highway—which was found necessary to relieve the extreme congestion of traffic caused by parking large number of cars on the roadway proper—involves the expenditure of \$55,500.

The construction of this Pensacola Gulf Beach highway, and the work now under way on the parking space, constituted the first step in making acces-

(Continued on Page Twenty One)

SUPREME COURT

(Continued from Page Seventeen)

Can Prohibit Use of Streets for Gain

Nothing obnoxious to the Constitution could be found in the law by either Court. The theory approved by the Court is that streets belong to the public and are primarily for the use of the public in the ordinary way, and, therefore, their use for the purposes of gain is special and extraordinary, and may, generally at least, be prohibited or conditioned as State legislatures may deem proper.—American Motorist.

SPECIFICATIONS MUST BE FOLLOWED CLOSELY TO SECURE GOOD SAND CLAY ROADS

How many engineers realize the necessity of following closely the specifications in constructing a sand-clay or top-soil surfaced road? How many even feel it of sufficient importance to write a specification on such a road? It is very difficult to impress an engineer with the necessity of skill and care in the construction of this cheap type of road surface. Not until he is charged with the responsibility of maintaining this type of road or has closely observed the greater stability and serviceability of a road of this type when properly constructed, will he realize that if successful results are to be obtained, it is absolutely essential that the same care be given in following the specifications in the construction of this type of road as in the higher and much more expensive pavements.—The American City Magazine.

CARE FOR THE MAJORITY

The great majority of our roads will always be without a hard surface; therefore, the study of the most effective and most economical method for maintenance of dirt roads is most important. In the end the maintenance of this class of road will be the big problem, even overshadowing the construction. A combination of the so-called patrol and gang system of maintenance is best. Proper maintenance is the most effective and immediate way to serve traffic.—The American City Magazine.

WHAT IS A GOOD ROAD

A good road, in the strictly modern sense, is one over which all legitimate classes of modern highway traffic can run rapidly, without interruption, and in safety, in any kind of weather, in any season of the year, and at any hour of the day or night.

Many roads are called good, by the motorist, if they are good part of the time and under certain favorable conditions. These same roads at other times may be very far from satisfactory. A road that is excellent today and bad a week from now is not a good road.

In the public mind the "good" road is often taken to include any road which is not hopelessly bad, or any road that is somewhat improved, or a road that under some circumstances is quite satisfactory. With

standards rising higher all the time it is well to emphasize that a road is not worthy of the name "good" unless it functions properly at all times. The difference in first cost between such a road and one that is satisfactory only part of the time is not great, especially when maintenance costs are considered, for it is a well-known fact that the cost of maintaining a fair road is much greater than the cost of maintaining a good one.—Indiana Highways and Motors.

THE HIGHWAY OF THE STARS

Ambition is life's greatest highway that points to the stars—it is lighted by the rays of hope that spring from the heart of man and paved with beads of sweat that fall from his brow. Few of us are fortunate enough to reach the heights for which we strive, but we gain all we get from the strain and sweat—and the struggle is always worth while.

For the accommodation of the masses, a good highway is probably of more importance than a railroad. This is at least true as regards passenger traffic, for a good highway paralleling a railroad carries from five to ten times as many people as the railroad.

Give us good roads or give us social isolation, economic paralysis, and intellectual stagnation.

Twelve thousand consolidated schools in the United States testify to the educational value of the highway.

Personal liberty does not mean that you can appropriate the highway irrespective of the rights of the coming vehicle. Your personal liberty ends where the other half of the highway begins.—Texas Highway Bulletin.

SAND LIBRARY AIDS BUILDERS IN CHOICE OF MATERIALS

Accessible to builders and contractors who want to know the value of various grades of material for construction purposes, a "library" of 2,800 bottles of sand, each marked with the results of tests to determine the suitability of the samples for commercial purposes, forms an important part of the scientific collection of a Chicago school. Specimens of sand from practically every state in the Union and from foreign countries have been gathered during the ten years since the "library" has been compiled. Records have been kept and pasted on the bottles as to the source of the material and grading.

MAY RELEASE WAR TRACTORS

Senator Capper, of Kansas, on February 26 introduced a bill directing the Secretary of War to turn over to the States for road building purposes approximately \$32,500,000 worth of tractors, trucks and other equipment now held by the army.

It is claimed that the War Department has on hand at the various army posts about 3,200 5-ton caterpillar tractors and about 600 10-ton tractors, that have been in storage since prior to signing of the armistice.

Congressman Reece, of Tennessee, introduced a like bill in the House.

PENSACOLA HAD SATISFACTORY YEAR

(Continued from Page Nineteen)

sible an ideal suburban neighborhood for which extensive development plans are being materialized.

The Pensacola-Flomaton highway, which upon completion will comprise forty-four miles of concrete paving, extends from the northern to the southern end of the county. Thus far over a quarter of a million dollars have been spent on this road. Contractors are the Holloway Construction Company of Mississippi.

Work on the Pensacola-Nunez Ferry road is being carried on by the Hancock Bros. Construction Co., of Mobile, Ala. To date over \$130,000 have been spent toward the completion of this road.

OFFICIALS MAY GO WEST

Within the next sixty days the executive committee of the American Association of State Highways Officials will hold a meeting to select the city for their next annual convention.

"If the State Highway Departments of the eleven Western States can guarantee sufficient attendance of highway engineers, of contractors and others interested in highway construction, together with the governors of the States, San Francisco will stand a good chance of being chosen," said W. C. Markham, executive chairman.

Other cities competing are Cleveland and Detroit.

As ye swerve, so shall ye skid.—Ex.

Where is the automobile first mentioned in the Bible?

When Moses went up on high.

Pioneers, O Pioneers!

Bring the wagon, yoke the steers,
Cast behind all doubts and fears!
Forward, through the waiting years!
Pioneers, O Pioneers!

'Tis your toil shall break the road;
'Tis your backs shall bear the load;
'Tis your souls must feed the goad!

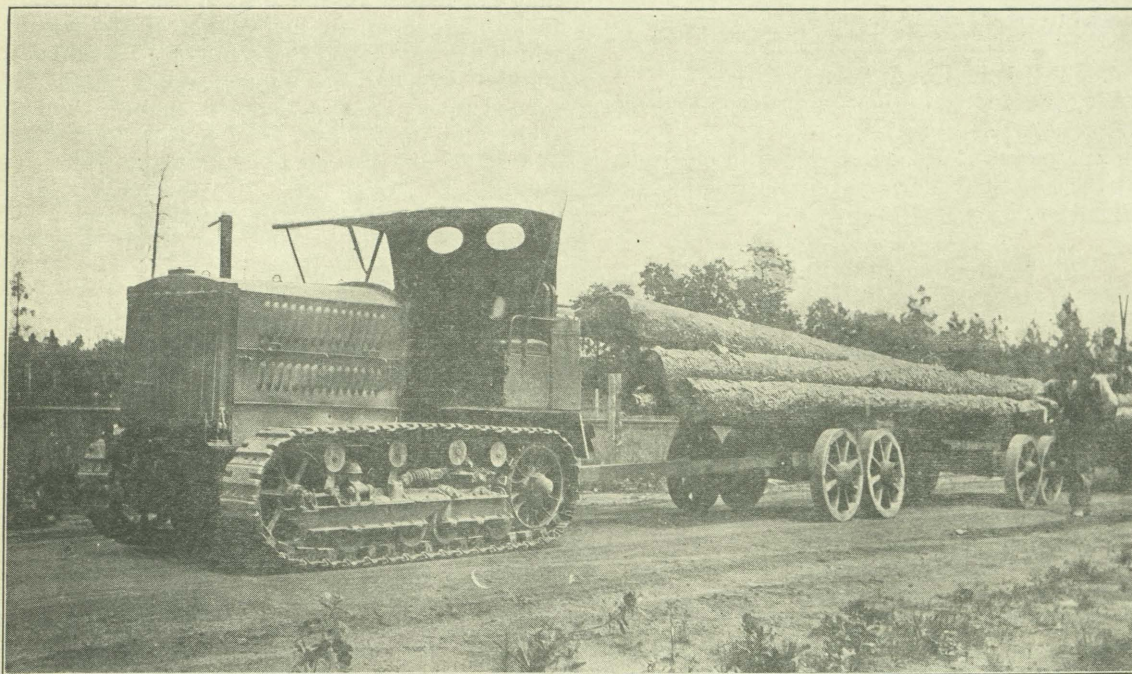
Where ye sow shall others reap;
Others laugh where ye must weep;
But your deathless souls shall keep
Vigil through the waiting years,
Pioneers, O Pioneers!

The annual capacity of Japan's cement mills was, before the earthquake, in the neighborhood of 14,000,000 barrels and plans are under way which will, within six months' time, bring this up to 17,000,000 barrels, notwithstanding the losses suffered by the earthquake. Until such time as this increased output is brought about, it is expected that the domestic supply will be inadequate and that considerable cement will have to be imported. In anticipation of this need, the Government has placed cement on the free list effective until March 31, 1924.

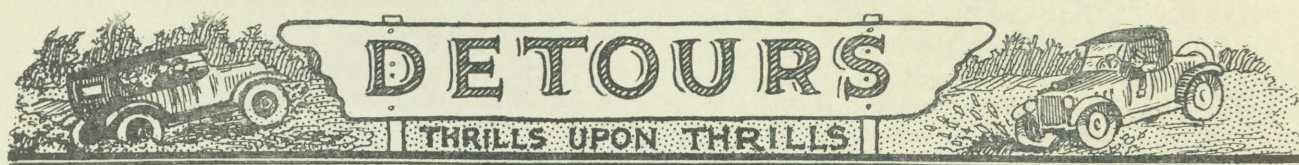
A Granite Falls newspaper records an accident in which an automobile ran into a cow without lights. Tail lights were out, presumably.—Thief River Falls Tribune.

Courtesy is the eye which overlooks your friend's broken gateway, but sees the rose which blossoms in his garden.

A TREMENDOUS LOAD ON A FLORIDA HIGHWAY



Much has been said in these columns relative to policing the public highways of the State. The above is a graphic illustration of this need. The improved roads of the State are too often subjected to such abuse.



THE ROAD HOG

The road hog went his merry way
And he was going west.
To crowd 'em over and crowd 'em off
He did his level best.

Another road hog hove in sight
And he was coming east,
To crowd 'em over and crowd 'em off
He cared not in the least.

They met—two piles of junk lay by;
Ha ha! we laughed—and then,
Out crawled the charmed degenerates
To hog the road again.

—A. S. G.

All the Amenities

“Well, if we can't get a house we'll live in our sedan.”

“Don't be foolish, George. We could not receive guests in our sedan.”

“You won't miss the social atmosphere. Plenty of cops will leave cards.”—Louisville Courier-Journal.

At any rate, Jesse James never raised a hood and tightened a spark plug and charged \$3.85.—Portland Telegram.

The only time pedestrians have the right-of-way is when the ambulance is taking them to the hospital.—Chickasha Star.

One Good Turn!

“What,” we asked of an honest automobile dealer, “is a complete overhauling?”

“Well, in the case of a used car taken in on trade,” answered the honest dealer, “it means turning back the speedometer.”

True—But Startling

A village girl eloped in a suit of her father's clothes. The next day “Daily News” came out with this sensational headline:

“Flees in Father's Pants.”

'Jew Ever Hear This?'

Teacher—“Ikey, give me a sentence containing the word 'statue'.”

Ikey—“Father came home late last night and mother said, 'Stat you, Ikey?'”

“Well, Bill,” asked a neighbor, “I hear the boss has had a fever. How's his temperature today?”

The hired man scratched his head and decided not to commit himself. “Tain't for me to say,” he replied. “He died last night.”

A highway means just what it says—a way high up from the water and mud.—American Highways.

Following Instructions

“A woman stopped here the other morning and asked for permission to blow up her tires. When she had put in 110 pounds, I said:

“‘Lady, you are putting in too much air. You will blow out your tires.’”

“‘Oh, no, I won't,’ she replied, ‘my husband told me to put in 60 pounds a week, and we are going away for three weeks.’”

A Current Joke

“A chap was arrested for assault and battery and brought before the Judge.

“Judge to Prisoner: ‘What is your name, your occupation and what are you charged with?’

“Prisoner: ‘My name is Sparks, I am an electrician and I am charged with battery.’

“Judge (after recovering his equilibrium): ‘Officer, put this guy in a dry cell.’”

Health Hint to Motorists

A lightning bug is about the only one that can get along with just a tail light.

Fifty-Fifty

“Before we were married you used to beg me to sing.”

“Well, you were making a fool out of me, too.”
—Judge.

Representative Marvin Jones of Texas complains that the female of the species has permitted herself to be caught up in the vortex of the speed mania which has enveloped the country. He said: “Styles change overnight. Women wear hats that are turned up in front and down behind, then down in front and up behind, then neither and then both. We drive 45 miles an hour going nowhere, just joy riding. Dr. Coue said of Americans, ‘they don't have time to say ‘every day in every way I'm betting better and better.’ They say, ‘hell, I'm well.’”—Texas Highway Bulletin.

BUILD GOOD ROADS

Gone are the days when “any road” would do,
Gone are the days when oxen pulled 'em thru,
Gone are days when devilish Fords were few,

I hear those voices loudly calling:

“Build GOOD Roads.”

We're coming, we're coming to the day of modern loads.

I hear those voices loudly calling:

“Build GOOD Roads.”

Gone are days when mud was right in style,
Gone are the days when three hours meant a mile,
Gone are the days when “highways” were on trial,

I hear those voices loudly calling:

“Build GOOD Roads.”

—Georgia Highways.

ROAD BRIEFS

The work of lighting the Cocoa-Merritt Island bridge has at last been completed, and now at nights the bridge can be seen for miles up and down the river, twenty-five lights radiating their brightness throughout the hours of the night for the users of this much-used structure. The Brown Electric Company had the contract and put the work through as quickly as possible, after getting permission of the war department to lay the cable in the river. The bridge makes a very attractive appearance at night time, and is much safer after dark for the pedestrians who use it at that time while taking a walk for exercise or to enjoy the fresh air afforded there.—Cocoa Times.

The highway from Altoona to Astor is rapidly nearing completion. There remains a mile and one-half to be surfaced with shell, after which this thoroughfare will be one of the best and most scenic highways in Florida, and will afford a more direct route from Jacksonville to Tampa and other Southern cities. A portion of this road is surfaced with sand clay and is smooth as velvet.—Eustis Lake Region.

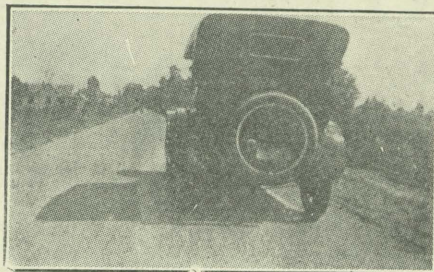
The Pinellas Park road and bridge district has sold its bonds, and a new highway and causeway will be built. That means the first free causeway to the gulf will not be to Pass-a-Grille key, though it will not be far from St. Petersburg. While local land developers scrapped over a location for a causeway another section of the county beat this city to it.—St. Petersburg Independent.

Many are using the Astor road going to Jacksonville. Good roads are reported, with exception of about a mile near Astor, which is being hard surfaced and will soon be completed. The route is much shorter than via Sanford or Crows Bluff.—Eustis Lake Region.

With the opening of the great highway from Valdosta, Ga., by way of High Springs, Dunnellon and Inverness to Brooksville and on to Tampa, Fort Myers and other cities of the extreme southern part of Florida, travelers will have an opportunity to see Citrus County over the finest road in the State, and with but a few miles lengthening of their journey and the expenditure of one or two hours' time, the most interesting scenic section of Florida, and this highway to be intersected with another road from beautiful Crystal River.—Crystal River Herald.

Plans and specifications are now being prepared by Hamilton G. Hatch, of the county engineering force, for hard surfacing the Eustis-Tavares highway, and will probably be concluded within thirty days, according to announcement today. The portion of the road not already hard surfaced is 2.88 miles in length, and \$65,000 has been provided for the project. The roadbed will be thirty feet wide and will be paved to a width of eighteen feet. Lime rock will be used as a base, which with the sand-clay foundation already established, will permit of the construction of an excellent road.—Eustis Lake Region.

For better Roads -SLAG



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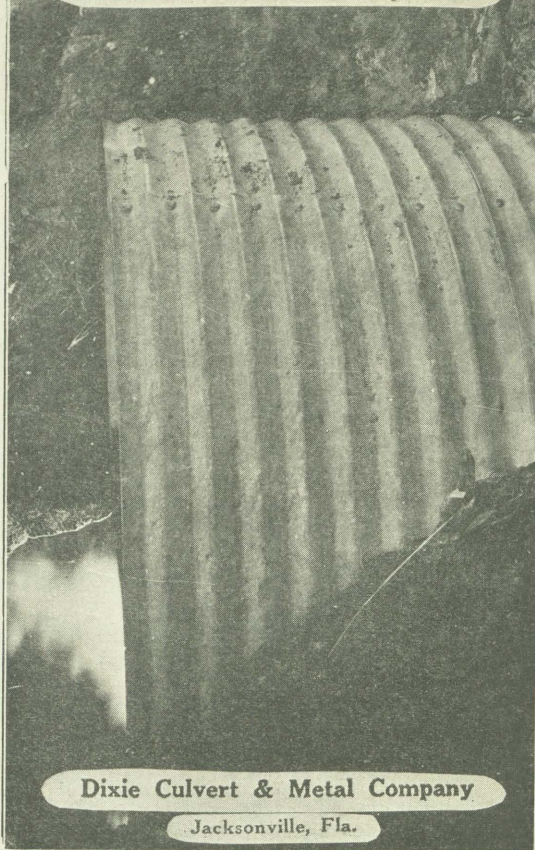
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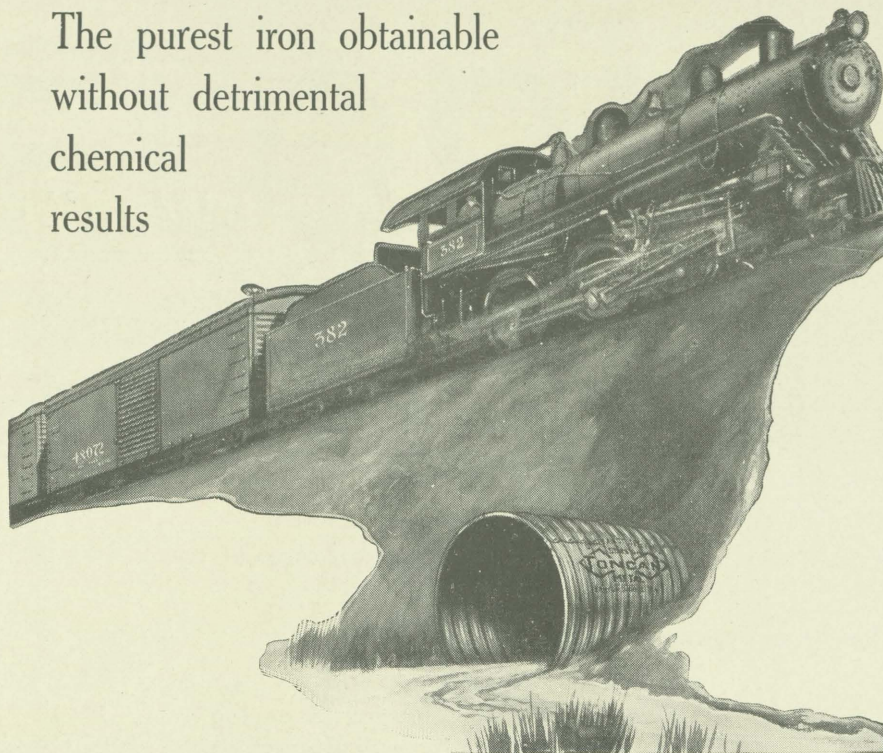
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